commodore

COMPUTING

international

March 1983 £1.00

USA $2.50

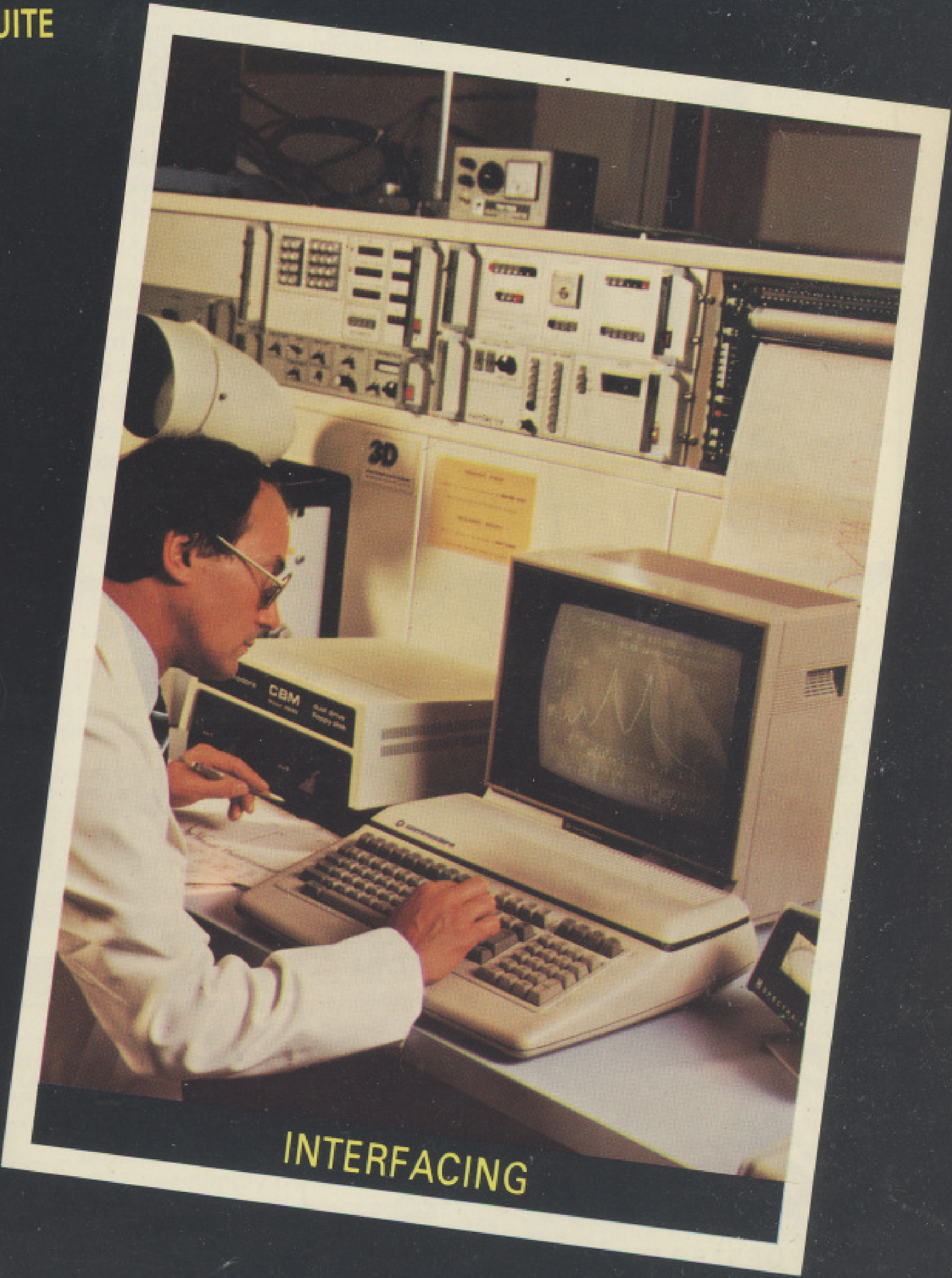
PEGASUS ACCOUNTING SUITE

PRINTERLINK REVIEWED

'EPIC' FOR ENGINEERS

BASIC AID

KNOW-HOW



New this month

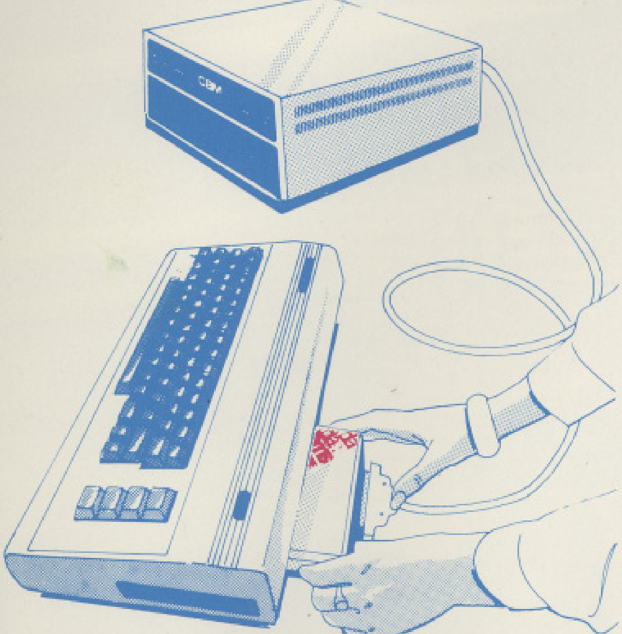
Home Computing Supplement

The independent magazine for Commodore computer users

VIC 20/ COMMODORE 64 IEEE INTERFACE

Only £49.95 + VAT

(Price including VAT £57.44)



The IEEE 488 is probably the most powerful and flexible of all interfaces and at DAMS we have now harnessed it into a special cartridge, which plugs easily into the back of your VIC 20 or Commodore 64 computer, allowing for the connection of all peripherals previously associated with the PET range to the VIC!

This new and revolutionary step has enormous benefits for the scientific or educational user. Most electronic instruments can be interfaced, via IEEE to 64, and in a classroom situation up to 15 VIC/64 computers can be connected to one central disk drive.

So, almost immediately, your 64 is transformed from a basic, home computer, into a sophisticated scientific and technical tool, with access to all PET peripherals, hard disk drives with up to 30 megabytes of memory, and up to 15 separate devices.

The IEEE automatically reconfigures the VIC 20/64 to input/output use, it allows simultaneous use of the VIC/64 serial bus, uses the standard PET/IEEE cable, and plugs directly into the VIC/64 memory expansion port. No software changes are necessary, and the cartridge comes with a full, 12 months guarantee for, only **£49.95 + VAT.**

COMMODORE 64, IEEE INTERFACE

The Commodore 64 version contains all of the benefits associated with the VIC 20, but also has:

- Automatically relocating code to allow plug-in cartridge programs.
- Reproduction of Commodore 64's memory expansion slot to allow you to use ROM based business software.

DAMS 12 MONTH GUARANTEE

DAMS Office Equipment Ltd. (hereinafter called the 'company') warrants the products it sells against defects in material and workmanship for a period of one year from the date of purchase.

During the warranty period, the company will repair (or at its own option, replace) at no charge, components that prove defective. This is provided the product is returned, shipping pre-paid, or by person, to Gores Road, Kirkby Industrial Estate, Kirkby, Liverpool L33 7AU, stating when it was bought and enclosing proof of purchase.

This Warranty does not apply if, in the opinion of the company, the product has been damaged by accident, misuse or misapplication.

DAMS OFFICE EQUIPMENT LTD.
GORES ROAD,
KIRKBY INDUSTRIAL ESTATE,
KIRKBY, NEAR LIVERPOOL. L33 7UA.
TEL: 051-548 7111

CREDIT CARD TELEPHONE ORDERS WELCOME (Normal Office Hours).

DEALER ENQUIRES WELCOME

Send your business card, and receive our dealer 'fact pack' NOW!
12 months parts & labour guarantee on all products.

E & OE

ORDER YOUR IEEE BY POST!

Please send me ______________ (Qty) IEEE interface(s)
@ £57.44 each (inc. VAT + P&P) for my VIC/64*
I enclose cheque/P.O. for: £ ______________
OR please debit my:
Access No./Barclaycard No. ______________
Name ______________
Address ______________
____
______________ Tel: ______________
(Price includes P&P) *Delete as applicable. C.C.I.3.83

commodore
COMPUTING
March 1983
international

CONTENTS

5 .... **NEWS** — *Three micros and a voice synthesizer from Commodore*
6 .... **NEW PRODUCTS** — *The latest in hard and software*
13 .... **SOFTWARE REVIEW** — *Pegasus offers an accountancy suite with payroll option*
17 .... **HARDWARE REVIEW** — *Printerlink, Data Tab and miniature printers from Epson*
20 .... **KNOW-HOW** — *Translation arrays; sine and cosine calculations; cursor positioning*
23 .... **INTRODUCTION TO MICROS** — *Third of a six-part series*
27 .... **INDUSTRIAL PROGRAMS** — *The Computer Room develops a package for engineering workshops*
33 .... **INTERFACING** — *Microcomputer-based gauging systems*
36 .... **BOOKS** — *Basic and the Personal Computer*
38 .... **BUSINESS PROGRAMS** — *A complete nominal ledger package. Part two: the sort program*
43 .... **BASIC PROGRAMMING** — *Load and save routine; software controlled immediate mode; disc handling*
49 .... **MACHINE CODE PROGRAMMING** — *Basic aid*

EDITORIAL

Managing Editor
Nick Hampshire
Editor
Pete Gerrard: tel 01-636 6531
Production Editor
Ron Scott
Advertisement Manager
Peter Chandler: tel 01-636 6408
Subscriptions Manager
Deidree Hammond-Parker
Tel. 01-636 6354
Programmer
Richard Franklin
Staff Writer
Martin Bush

Typesetting by
Centrepoint Typesetters Ltd, London
Printed by Spottiswoode Ballantyne Ltd,
Essex, England.

Distributed by S&M Distribution,
London. Tel. 01-274 8611.

Commodore Computing International
is not in any way connected with
Commodore Business Machines
U.K. Ltd. It is published monthly by
Nick Hampshire Publications,
167-169 Great Portland Street,
London W1.

Our new supplement, especially for VIC and 64 users, this month features Will O' The Wisp, an Adventure game for the 64.

Adventure games have been with us almost as long as the computers that spawned the first and justifiably most famous one of them all: Adventure itself, from which all others have taken their generic name.

The PET version of the game is known to a number of people, thanks to the tireless efforts of Jim Butterfield, and has forced many Adventure addicts to spend sleepless nights trying to bribe the troll, escape from the mazes and find out what to do with the plover's egg, among other bizarre tasks.

What is the secret of these games, and why do people become so involved in this strange and mysterious world? Part of the answer may lie in the use of words, rather than images, to convey the sense of wonder and bewilderment, danger and intrigue, at being lost in an underground cavern in search of weird and wonderful treasures.

The mind can conjure up far more than the eye can ever hope to see simply by looking at a computer generated drawing. Not even the finest Disney cartoon could hope to recreate anything like the vision of the world that your brain will paint for you as you explore endless corridors.

With the advent of the Commodore 64, it won't be too long before hosts of games start appearing on the market.

commodore COMPUTER

PET PACK

BRING TO YOU, NOW ON CASSETTE AND DISK GAMES OF THRILLS & SKILL FOR ALL THE FAMILY

NEW PROGRAMS

Best of Arcade brings together the three most popular Petpack games, Invaders, Cosmic Jailbreak and Cosmiads. These old favourites have been updated to run on 80-column machines also!

MPD 121 BEST OF ARCADE £22.50 - DISK PACK

Best of Treasure Trove gives you twenty of the best games from the Treasure Trove series, including four arcade-type games, Night Drive, Car Race, Breakout and Money Table! There are simulation games, brainteasers and more, making this package the best value ever in games!

MPD 122 BEST OF TREASURE TROVE £22.50 - DISK PACK

Assembler Tutorial is an extremely well thought out cassette-based package which teaches Assembly Language programming. Now for the first time, you can sit at your computer and learn at your own speed with this self contained course combining lessons with hands-on practice!

MP 124 ASSEMBLER TUTORIAL £50.00

Resident Assembler for all PETs
With excellent documentation and examples.

MP119 RAMP £22.50

Disk Packs available in either 8050 - D8 format or 3040/4040 - D4 format. Please state D8 or D4 when ordering.
Prices include VAT and P&P.

PUB GAMES

This latest disk package brings you five totally new games, never before seen on a PET screen! The programs will all run on 80-column machines also!

DISASTEROIDS - Your mission - pilot your spaceship through the treacherous asteroid belt using your lasers to blast as many asteroids as possible. The PET version of the famous arcade game!

STELLAR WARS - Your spaceship is being pursued by the fighter ships of the evil Empire. You must take control of the ship's laser cannon. Get the fighters in your sights and blast away. The future of the universe depends on your skill and accuracy.

WAR! - You are the captain of the British torpedo boat. You must steer your ship through the minefield to destroy the four shore bases. Unfortunately, you only have two torpedos at a time, so you must get through the minefield again to rearm. Prove that we still rule the waves!

STAR FIGHT - The Alien Invaders are coming again! Control your laser cannon to blast their ships out of the sky and destroy their missiles and bombs. Accuracy and quick reflexes are essential.

DEPTH CHARGE - Your mission - seek out and destroy the enemy submarines. They are armed with mines which they release to float up at you. You must control the position of your ship and fire your depth charges to destroy as many subs and mines as possible without being hit.

MPD 123 PUB GAMES £22.50 - DISK PACK

These games are available separately on Cassette at £6.99 each!

commodore COMPUTER
PET PACK
commodore COMPUTER
PET PACK
commodore COMPUTER
PET

MANUFACTURED AND DISTRIBUTED BY AUDIOGENIC LTD.
AVAILABLE FROM GOOD DEALERS, OR DIRECT FROM:

AUDIOGENIC, P.O. BOX 88, READING, BERKS.
Tel: (0734) 586334

Commodore announce . . .

Three new micros and a voice synthesizer

Commodore International's production plans for 1983 include three portable computers, each with 64K of built-in user RAM. All three systems will have built-in 5inch display monitors, two of them in colour, plus one or two built-in floppy disk drives providing 170K or 340K of additional storage capacity. The systems will be compatible with the 64 when using software and peripherals.

Chairman Mr Irving Gould said the micros would cost substantially less than comparable products. Prices would range from $995 for a system with a built-in 5 inch monochrome display and single disk drive, to $1,595 for a system with a built-in 5 inch colour display and dual disk drives.

Commodore has also developed a new voice synthesizer for the 64 personal computer. This is the first voice I/O product to be developed at the company's speech technology division in Dallas, Texas.

The speech add-on can generate a variety of voices, including women's and children's, for games and learning cartridges, and can be used with the Commodore Basic programming language. It has three modes of operation, two of which are immediately available with the basic module, and a third with the purchase of optional cartridges.

Basic commands

The voice module can be used as soon as it is inserted in the cartridge port of the 64. The user can create speech through simple Basic commands, such as:

```
SAY     "A", "B", "C", OR
10      SAY "ENTER YOUR NAME"
20      INPUT B$
30      SAY "THANK YOU"
```

This short program instructs the computer to speak the name typed in from the keyboard.

The most exciting feature of the module, says Commodore, is its ability to integrate voices into games and learning cartridges. Because it can accept different vocabularies and voices, computer owners will be able to choose the type of voice (male, female, child's, cartoon character etc) used with various programs.

This flexibility is achieved through a special technique which allows speech to be generated while the computer's microprocessor is performing other functions such as graphics/cartoon animation.

The synthesizer is able to execute graphics on the screen and generate speech at the same time. Commodore expects to sell the product for under $100, with delivery scheduled for Spring 1983.

Sales still booming

Commodore International Ltd's sales in the three months ending December 31 1982 were the highest for any quarter in the company's history, said Chairman Mr Irving Gould. Sales totalled $175 million compared to $70.1 million in the same quarter of 1981.

Mr Robert Lane, president of operations for North America, announced that the company had sold a million VIC-20s. "Last year we predicted we would sell more home computers in 1982 than all the other companies combined sold in 1981. We were right. Not only did we sell a record number of VIC-20s, but the Commodore 64, which we introduced in September 1982, has already sold over 50,000 units," said Mr Lane.

Short shows

A series of one-day computer exhibitions displaying products for small businesses will be held at various centres around the country this year. The exhibition fee of £300 will include all extras like electricity. The shows will be open from 10am to 6pm, admission free.

The venues are:

Great White Horse Hotel, Ipswich, March 10.
Holiday Inn, Plymouth, March 31.
Midland Hotel, Manchester, April 14.
Post House Hotel, Southampton, May 12.
Strathmore, Luton, May 26.
Holiday Inn, Croydon, June 16.
Draganora Hotel, Leeds, September 1.
Central Hotel, Glasgow, September 22.
Albany Hotel, Birmingham, October 6.
Park Hotel, Cardiff, October 27.
Holiday Inn, Liverpool, November 10.
Ramada Hotel, Reading, December 1.

More information from Steven Martin, 153-155 High Street, London SE20 7DP (telephone 01-778 1102).

Improving machine tools

Taylor Wilson Systems have launched two packages aimed at reducing errors in operating digitally controlled machine tools. The programs do not design the tools themselves but imitate the machining process by combining a high resolution graphics board with a printer, thus eliminating any errors in the trial stage.

The two packages, Toolpath and Millpath, are a sequel to Taylor Wilson's Tapeprep program. Millpath is designed to simulate the Bridgport Series 1 milling machine, the output being printed in different colours to show depth and density. Toolpath makes use of the Larner and Swasey 2SC lathe.

After the program has been machine checked and run, and the image of the changing action of the tool has been displayed, the results are printed out in four modes ranging from same size to double size low density. Each program runs on standard PET equipment.

Area: *Simulators.*
Company: *Taylor Wilson Systems.*
Address: *Station Road, Dorridge, Solihull,*
West Midlands.
Tel: *05645-6192.*

Games for the VIC

Audiogenic Ltd and Boots have teamed up to market a selection of Audiogenic's cassette games which can be used in conjunction with the VIC. From the outset, five games — Amok, Golf, Seawolf, Alien Blitz and Vicalc — will be available in some of the larger stores, the prices ranging from £6.95 to £8.95.

Converting programs

Following the launch of the Petspeed compilers for the CBM 64 and 720 computers, Oxford Computer Systems have announced a new range of cross-compilers for Commodore machines.

A cross-compiler, which compiles on one machine and produces object code for execution on another, enables software houses to convert existing PET programs for the new Commodore 64 and 720 while taking advantage of the 8032's facilities.

The Portspeed compiler allows the generation of object programs for execution on the 64 and makes changes where necessary to take account of the 64's screen addressing. With this compiler, says Oxford, programs containing screen pokes will run on the 64 without alteration.

The X-64, a cross-compiling version of Compiled Integer Basic, generates fast machine code for execution on the 64 or the VIC-20. Speed improvements range between 100 and 1000 times and advantage can be taken of the 64's extra memory.

Oxford are offering special terms to those customers who have already bought a Petspeed compiler for the 8032 or 4040 PET.

Area: *Compilers.*
Company: *Oxford Computer Systems (Software) Ltd.*
Address: *The Old Signal Box, Hensington Road, Woodstock, Oxford OX7 1JR.*
Tel: *0993-812700.*

Printers and stands

Superwriter II is a new 80/132 column dot matrix printer from Gallid Ltd. It can be interfaced with any computer which has RS232, V24 or 20mA current loop interfaces with switch selectable baud rates between 50 and 19.2K. The printer itself houses a Centronics interface which accepts 8 bit parallel data as well as an IEEE 488 interface. The bi-directional printer has an output of between 40 and 132 characters per line with either 6 or 8 lines to the inch. It comes with a standard 750 character buffer with an extra 1K buffer optional if required. Any paper width from 2.5 to 10in is accepted, the paper being fed by tractor feed.

The Gallid Superwriter II 80/132 column dot matrix printer, suitable for most computer installations

Gallid VDU trolleys designed for all types of computer and associated hardware

Gallid also produce a range of made-to-measure computer trolleys, designed to ensure that the equipment is at the correct operating height for the user. The base of each trolley comprises five urethane legs on castors. The trolley costs £69.90 and comes with a five-year guarantee.

Area: Accessories.
Company: Gallid Ltd.
Address: 1 Bilton Road, Rugby, Warwickshire.
Telephone: 0788-74442

PET cleaning kit

Valam Computer Supplies are the main distributors in the south-west for A.F. computer cleaning products. These include the PETkit (£30 plus VAT) for cleaning and maintaining PETs. There is an anti-static aerosol called Foamclene which can be sprayed onto external surfaces and then wiped off with one of the 10 Safecloths provided. The makers suggest that Foamclene should not be sprayed on the keyboard; this should be cleaned by dabbing with a Safebud moistened with the aerosol.

To clean the floppy disc drives spray Floppiclene on Drive 0 after the necessary instructions have been typed, type in RUN and the heads will be cleaned. There is also an aerosol for the cassette deck, a special cloth for the screen and a glove to wear while cleaning.

Area: Maintenance.
Company: Valam Computer Supplies.
Address: 54a Norfolk House, The Terrace,
Torquay, Devon TQ1 1DE.
Tel: 0803-213578.

Grand Master

Grand Master is the name of the new home computer chess game designed by Audiogenic Ltd specifically for the VIC, with an expansion of 8K necessary. Main innovation here is that the player can take moves back and study the results of other moves. There are 10 levels of play; if your name is not Victor Korchnoi, the program will advise on moves and suggest move sequences; it becomes the tutor as well as the opponent and will also display the best possible move at any stage of play.

Grand Master is available from the manufacturer or through the VIC dealer network for £7.75, which includes VAT.

Area: Software.
Company: Audiogenic Ltd.
Address: P.O. Box 88, Reading, Berkshire.
Telephone: 0734-586334

Programs for accountants

Yet another suite of financial accounting systems, this time from Spectrum. This one has a total of 17 products, including sales ledger, payroll, purchase ledger and stock recording integrated with invoicing, costing between £100 and £750. The main ledgers (sales, purchase and nominal) each cost £300 and if you want to integrate them all that will be a further £100.

The programs are designed for the 3/4/8000 series; all of them are suited to the 8000 series but not all are compatible with the 3000 and 4000. The sales/purchase/nominal ledgers can be used with all three series. All of the systems carry a three month warranty.

Area: Accountancy.
Company: Spectrum Computer Services Ltd.
Address: 11 PO Box 199, Kershaw House, 55
Well Street, Bradford, West Yorkshire,
BD1 5RJ.
Telephone: 0274-30 188.

Four colour printer

Two Japanese firms NEC and Shin Nippon Denki, have jointly developed a Four colour printer plotter called the PC-6022. With an average print speed of 12 characters per second on continuous 10 inch roll paper, the PC-6022 is designed to produce diagrams, graphs and text for PC-6000 computers. These are not available in Britain but the printer can be connected to other computers. The printer is being marketed only in Japan (for £87) but the companies hope to export it to both the United States and Britain.

COMPSOFT DMS — Data Management System

This versatile database is available for almost all combinations of Commodore hardware.

Commodore 3000 series 200.00 pounds
4000 series and 8032/4040 combination 250.00 pounds
8032/8096 with 4040 or 8050 disk drives
Standard system £290.00 pounds
8032/8096 with 4040, 8050, 8250 or hard disk drives
DMS DIAMOND (multi-file) 395.00 pounds

All systems create files, sort and search on multiple parameters, calculate, print lists, labels and reports and link to Wordcraft, Wordpro and User Written Software. Both the manual and screen messages are written in straightforward conversational English, making the system ideal for management and secretarial staff to use without technical help.

Those versions for the 8032/8050 screens have their own letter writer for automatic selective mailing, plus links into Vivicalc. DMS holds the largest records of any database system on Commodore machines (up to 1000 characters on most systems).

Ring Compsoft for full details, specification sheets and details of your local trained stockists. We also have full guides, free of charge, which describe DMS working in particular jobs such as Personnel, Stock, Invoicing, Sales and Purchase ledger, Client, Library, Property, Costing, Medical, and Student records.

DMS also runs on microcomputers with the CP/M and MSDOS operating systems. These include the Sirius and IBM PC.

You'll be pleasantly surprised at what we have to offer. Find out more today. Ring or clip the coupon now.

Compsoft Ltd
Hallams Court,
Shamley Green,
Nr Guildford,
Surrey GU4 8QZ

Tel Guildford (0483) 898545

Company Name..
Address..
....
....
Tel..
I have a .... model Commodore business machine.

Set your own quizzes

From The Computer Room in Tonbridge, Kent, comes a range of computer products for the VIC-20, priced from £1.75 to £40.25.

The Quiz Master consists of one program tape and several subject tapes — junior maths, French and eight other subjects. Each tape contains four quizzes and about 200 questions plus instructions on how the user can create his own quizzes.

Sprint is TCR's program for editing and printing letters as well as saving them on tape, while Label is a complementary program which can also run alone. As its name suggests, Label is an address labelling system with information stored on tape.

For £8 you can also buy a program allowing you to construct your own flowcharts on screen. If you are producing club news for your local society or trying to attract attention to sales offers, Post, price £14, produces an englarged set of characters with a smart printed format.

Car Sales is the most expensive at £40.25. It produces quotations for use in the showroom which can be updated with current prices and trader details. Not only the price of the car is quoted, but also tax, delivery charges and the cost of extras. Again, the product file is kept on tape.

Post, Flow, Sprint, Label and Car Sales all require a VIC printer for the output. Quiz Master needs at least 3K expansion, Post, Car Sales, Sprint and Label require at least 8K and Flow 16K.

Area: *Educational games, business accessories.*
Company: *The Computer Room.*
Address: *87 High Street, Tonbridge, Kent TN9 1RX.*
Tel: *0732-355962.*

Maintaining drives

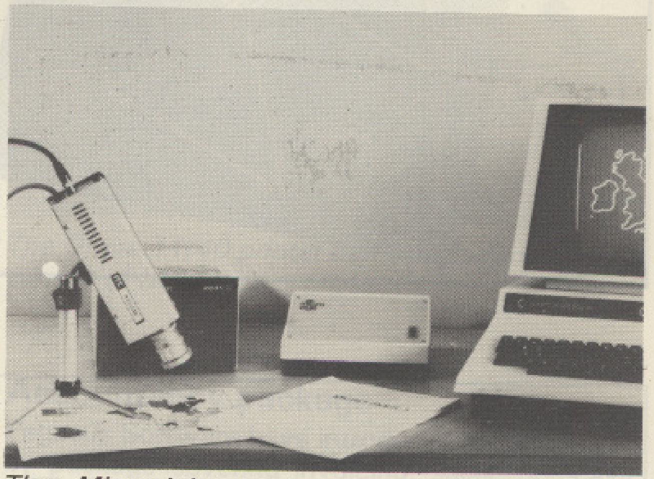
International Data Automation Ltd are the European distributors for the PerfectData head cleaning kit from Innovative Computer Products. The kit is for disk drives and contains two cleaning disks, a four ounce bottle of cleansing solution and a dispenser. You put one of the cleaning disks plus solution in the drive and operate for about 30 seconds. As the fluid evaporates, the disk dries the head. The kit costs £12 and lasts for about six months.

Area: *Maintenance.*
Company: *International Data Automation Ltd.*
Address: *13 Station Parade, Virginia Water, Surrey GU25 4AB.*
Tel: *09904-4994.*

Data in graphics

Digithurst has launched a vision system called MicroSight, priced at £495 plus VAT. It is designed for the 4000 series, connecting via the user port. The system consists of a standard CCTV camera which uses a Microeye interface to send back 8 bit digital video to the computer. The system has a set of command processor and disk handling routines and several machine code routines to process and display data in high resolution graphics.

The non-standard software includes a program called Microscale which calculates the numerical data for perimeters and allows the user to put the dimensions to any captured image. The system is aimed at the educational and research and development markets.



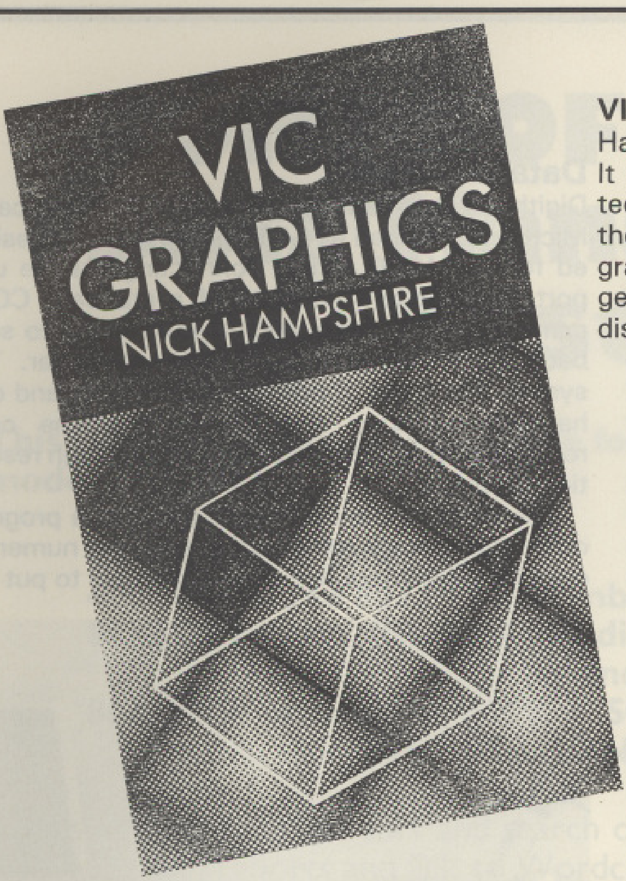
The Microsight package comprises a CCTV camera, Microeye interface and software.

Area: *Software.*
Company: *Digithurst Ltd.*
Address: *Leaden Hill, Orwell, Royston, Herts SG8 5QH.*
Tel: *0223-208926.*

Typesetting service

Reprodesign are offering a service which enables text, whether on cassette or disk, to be typeset in the format of books, manuals etc. The information can also be sorted into alphabetic order and updated if need by. The cost of the service is normally between £5 and £7 for one page of A5 material.

Area: *Typesetting*
Company: *Reprodesign.*
Address: *131 Market Street, Chorley, Lancs PR7 2SG.*
Tel: *02572-78376.*



VIC GRAPHICS. The latest book from Nick Hampshire.
It introduces the reader to the programming techniques used to generate graphic displays on the VIC. This 192 page book is full of Basic programs which take the reader from simple shape generation to advanced three dimensional displays.

Price £6.95 + 50p p&p

Also available are these other books by Nick Hampshire:
VIC REVEALED — £9.95 + 50p p&p
PET GRAPHICS — £10.00 + 50p p&p
LIBRARY OF PET SUBROUTINES — £10.00 + 50p p&p

From: NICK HAMPSHIRE PUBLICATIONS, P.O. BOX 13, YEOVIL, SOMERSET.

commodore
COMPUTING
international

SUBSCRIPTION ORDER FORM

Please send me 12 issues of *Commodore Computing*

CHEQUE ENCLOSED ☐

PLEASE DEBIT MY ACCESS ☐

AMERICAN EXPRESS ☐

BARCLAYCARD ☐

CHARGE NO. ....

Cheques should be made payable to:
Commodore Computing — cash with order please.

TO AVOID FUTURE LAPSE IN MY SUBSCRIPTION PLEASE DEBIT MY RENEWAL FEE TO MY CREDIT CARD ANNUALLY UNTIL CHANCELLED IN WRITING BY ME.

Name..

Address..

....

Telephone (home)...

Business...

Signed..

Date...

☐ Subscription rate U.K. £15.00
☐ Europe £20.00
☐ Outside Europe £28.50

COMMODORE COMPUTING INTERNATIONAL

Commodore Computing International
Subscription Manager
167-169 Great Portland Street,
London, W1

The interfacing Qume

ISG Data Sales have made available the Qume 11/40 Plus modular interface daisy wheel printer and the General Electric 3000 series of dot matrix printers. The 11/40 Plus offers RS232C, Centronics and IEEE 488 interface options. The bidirectional Sprint 11/40 Plus prints text at a minimum speed of 40 characters a second and has a command set compatible with the Sprint 5 and 9 range to make upgrading simple. Aimed at the desk top computer market, Sprint is priced at £1,430, the interface costing an extra £80-£100.

The 3000 series prints at 180, 200 or 500 characters a second and between 10 and 16.5 characters per inch with 80 or 136 columns. Graphics can also be produced on the machine in the shape of a 72 × 72 dot/inch form. Among the features of the series is a 512 character line buffer, and built-in fault diagnostics.

Area: Printers.
Company: ISG Data Sales Ltd.
Address: Unit 5, Wellington Industrial Estate,
Basingstoke Road, Spencers Road,
Reading, Berks RG7 1AW.
Telephone: 0734-884666

Nimrod Software

Has the program YOU need not been written yet?
Then YOU need NIMROD SOFTWARE.

We specialise in bespoke programs for the Commodore Pet. Whatever your application you can feel confident that you will receive a really professional service. We follow a formal and well proven procedure which will assure your satisfaction:

1. A senior analyst will visit you to discuss your application and a detailed estimate will be sent to you.
2. When you order, your requirements will be analysed in fine detail and a full specification will be prepared.
3. When you are satisfied that the specification meets your requirements you will receive our FIXED PRICE quotation. This will not differ from the original estimate unless major alterations have been agreed during the preparation of the specification.
4. The programs will be written to the highest professional standards using advanced techniques and then very thoroughly tested.
5. Your programs will be fully GUARANTEED for ONE YEAR.

If the program you need is not available "off the shelf" then call .... **IAN DOLMAN on 01-878 6498.**

Nimrod Software – Practical and Efficient Programs for Micro Computers

HP
TRS80
XEROX
COMM
IBM

The Qume 11/40 printer can be interfaced with a variety of hardware.

Accountancy package

Pegasus Software have introduced an accountancy package covering invoicing, sales, purchase, nominal ledgers and stock control. The programs are available separately or as a package and are designed to work on the 8000 series. The system automatically updates the relevant customer/supplier account and has the facility to display and print out accounting reports. It asks the operator if information is to be added or subtracted while looking out for operator errors.

Area: Business programs.
Company: Pegasus Software Ltd.
Address: Station Road, Kettering, Northants.
Tel: 0536-522822.

Hydra and Dataview

A brief mention for Hydra, the local area network system which we featured in our December and January issues.

Although the January issue stated that IJJ were marketing this LAN system under the name of Hydra, Dataview would like it known that they have sole world marketing rights. IJJ have apologised and agreed that they should not be selling it.

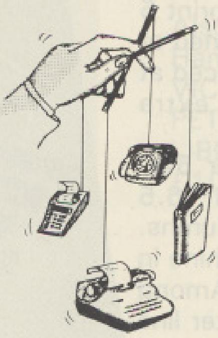
So if you're interested, Dataview are the people to approach.

IF YOU HAVE ONE OF THESE...

AND YOU WOULD LIKE...

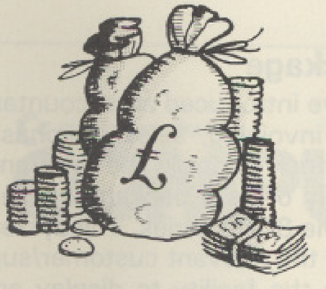
THE PERFECTION OF
A TAILORED SOLUTION

THE ABILITY TO AUTOMATE YOUR
BUSINESS ROUTINES THE WAY
YOU WANT



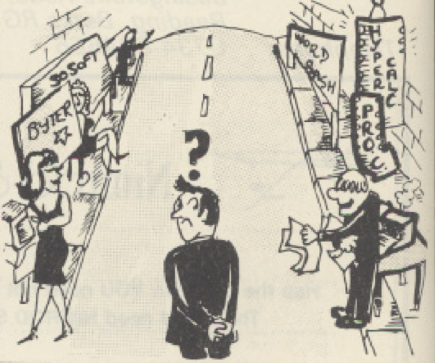
WITHOUT THE FEAR OF
MAKING THE WRONG DECISION

WITHOUT THE
HIGH COST



WITHOUT BEING A
COMPUTER EXPERT

IN WHAT CAN ONLY BE DESCRIBED
AS A CONFUSING MARKET



SILICON OFFICE DOES IT ALL

Add muscle to your 8032 with a memory expansion board and SILICON OFFICE and give yourself some elbow room. SILICON OFFICE is a leading software product for the Commodore 8096, that offers you the ability to create and control your application system(s) the way you want it.

The unique 'data base' facility in SILICON OFFICE has easy to use routines to draw record cards on the screen, insert and 'housekeep' your file information and then combine and analyse data from several files to produce complex reports designed to your needs. Simple but repetitive routines can be stored for subsequent execution. A powerful word processor is built in, available at all times, with the emphasis on ease of use for the average typist.

In fact SILICON OFFICE can be considered as a product offering three packages in one with communications complementing the data base and word processor. If you already own a Commodore 8032 this can be quickly upgraded to the latest technology micro-computer — add SILICON OFFICE and you will have a total and cost effective solution to your software needs for years to come and all of this for just over £1000. For more details contact your Commodore dealer or complete the coupon below.

PLEASE SEND ME MORE DETAILS ON SILICON OFFICE

Name ____________________

Position ____________________

Company ____________________

Address ____________________ Telephone: ____________________

Send to: Bristol Software Factory, Kingsons House, Grove Avenue, Queen Square, Bristol BS1 4QY. Telephone 0272 277135

Accounting suite with payroll option

Software packages go through phases. For six months you see nothing but word processors, then you have six months of data bases, and we now appear to be going through the "year of the accountancy package", with company after company producing yet another suite of programs.

With a number of good packages already available, it makes you wonder why anyone should bother producing a new one. However, Pegasus Software Ltd have recently updated their existing product to incorporate a payroll option, so this month we take a look at that.

Overview

Like any other business program, the idea behind "going computerised" is to increase the efficiency and decrease the cost involved in running an office. It is refreshing to read in Pegasus' write-up that they do not suggest the immediate scrapping of an existing manual sytem. Rather, let the two run in parallel for a month or so to ensure that the new method is producing the same results as the old one, or perhaps even highlights a problem in the way things used to be run.

Once you are satisfied the computerised system is as efficient as the old one in all respects other than time and cost, you can discard the old method and rely on the computer for input and output.

Security must not be forgotten. The Pegasus suite operates on a grandfather, father, son (G.F.S.) basis, with strict emphasis on taking, regular back-up copies. Using the G.F.S. method, if any data is lost, you lose only the most recently entered information; re-keying time is kept to a minimum.

Do what they tell you

This is a completely integrated package, with an initial menu allowing you to choose from sales, purchase, nominal, invoicing, stock control or payroll, with two further options to back-up a disk, or leave the program. Never try to leave the program simply by switching everything off; Pegasus often leaves files open for quicker access, and improperly closed files at the end of the session can lead to corruption and loss of data, so always do what they tell you. It doesn't take long.

All sections of the main progam are interlinked: stock control links to invoicing, which links to sales ledger, and so on. On the other hand, all of them have been designed (with the exception of the invoicing, which of necessity needs to link to the sales ledger) to stand on their own as well. Thus you could buy only the stock control system or the payroll, then integrate the programs later.

> Pegasus do not suggest the immediate scrapping of an existing manual system. Rather, let the two run in parallel for a month or so

The package comes in a securely wrapped box, complete with excellent manual, one program disk and one demonstration disk (useful for finding your way around), and, as security, the inevitable dongle. Makes a change from uncopyable disks.

Indeed, your first step on start-up is to make several back-up copies of the master disk. I would suggest backing up the demonstration file disk as well in case of disaster.

After that, a quick shift and run stop and you're away.

Both the manual and the program in operation appear to have been written for accountants who want to use a computerised system, rather than computer users who want to become accountants. The former stand a chance with the right system, the latter don't.

Appropriate part

After a brief pause for loading the first program, you are presented with the menu mentioned earlier. From this you leap straight into the submenu for each different option, and again it is but a small step to load the appropriate part of that option.

One criticism. Although they have tried as far as possible to make everything a single key entry, this method does have its drawbacks. When selecting your menu choice, disk lights whirr and programs begin loading, but the screen refuses to acknowledge that you've done anything for a while, and even then it only comes up with the single word "loading'. All you know is that you pressed either "4" or "5", and thus have to wait a while to make sure you got the right one.

Two other points which rapidly become annoying. A lot of time using this package will be spent keying in data, and to those of us used to a PET keyboard and the way it operates, a nightmare presents itself.

Presumably most of the people who buy this package will not have used a PET before, but the points are still valid. One is that the delete key, instead of deleting the character to the left of the cursor, wipes out the whole field you're currently typing in. The other is that "insert" doesn't work at all.

These aside, let's see how much information you can store.

Capacity

This will depend on the configuration you're using, but assuming the most common choice of an 8032 with an 8050 (the type of printer you use will depend on the type of output you want; enough has been written on this already) it goes something like this. Both the sales and purchase ledgers can handle up to 8,000 transactions, with an accompanying 1,500 customers and suppliers.

Nominal is (sensibly) reduced to 4,000 transactions spread over some 1,500 accounts, and the invoicing side can handle up to 2,000 products. The stock control option can similarly handle 2,000 products, with up to 4,400 product movements. Using the payroll package, you can herd up to 500 employees onto a diskette.

Using an 8096 with a hard disk system, this goes up to around 5,000 customers, suppliers etc and about 10,000 transactions. Most of this is stored in the form of relative files, so file handling is generally rapid.

This is assuming that one file handles sales, one purchase, and so on, and that you have one file per disk. You are instructed where and when to interchange disks, but if volumes are low enough it makes sense to put more than one file on each disk to save both time and the possibility of accidental data corruption as disks are continually swapped around.

Clearly something of a superior package, and so it should be at around £1,500. It also shows the hallmarks of being a compiled program: the familiar listing of 0 SYS (1058) has been seen before. This is a good idea. Develop it all in Basic for easy programming, and compile it immediately prior to release for speed of running.

Area: *Accountancy suites.*
Company: *Pegasus Software Ltd.*
Address: *Douglas House, 27 Station Road, Kettering, Northants.*
Tel: *0536-522822.*

MICROSCRIPT

- more space than any other Commodore word processor

See MicroScript at your Commodore dealer.

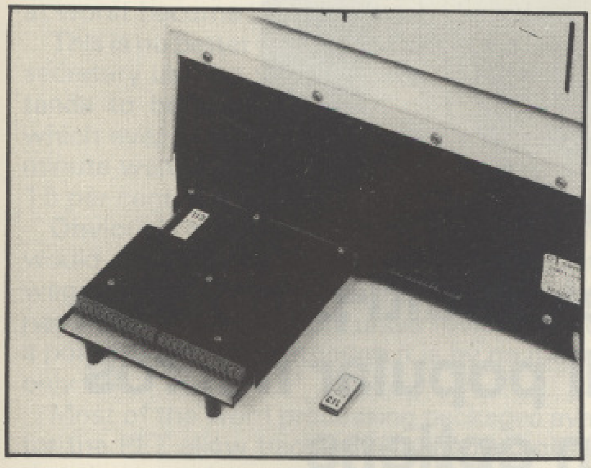
In desperation phone SUPERSOFT 01-861 1166

A NOTICE TO ALL

PET LOVERS

INTRODUCE YOUR PETS TO OURS

AND SOLVE YOUR INTERFACE PROBLEMS



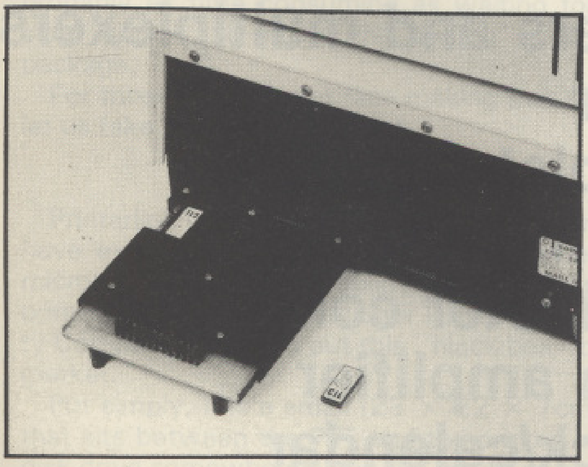
Only £195.00

ANALOGUE/DIGITAL I/O

THE PUPI

- * 4 ANALOGUE INPUTS (12BIT)
- * 2 ANALOGUE OUTPUTS (12 BIT)
- * 4 RELAY OUTPUTS
- * 4 LOGIC INPUTS

When connected to the "PET" User Port the PUPI gives you all the above features together with an operating system in EPROM, which interacts with Basic's variables, giving extremely simple operation. Inputs and outputs are ±10V and relays are rated at 10VA. Logic inputs can be used for microswitch sensing etc.



Only £195.00

HIGH SPEED A/D CONVERTER

THE PUSSI

- * 4 ANALOGUE INPUTS (12 BIT)
- * 50 MICROSECOND CONVERSION
- * STOP AND START TRIGGERS
- * DATA ACQUISITION SOFTWARE

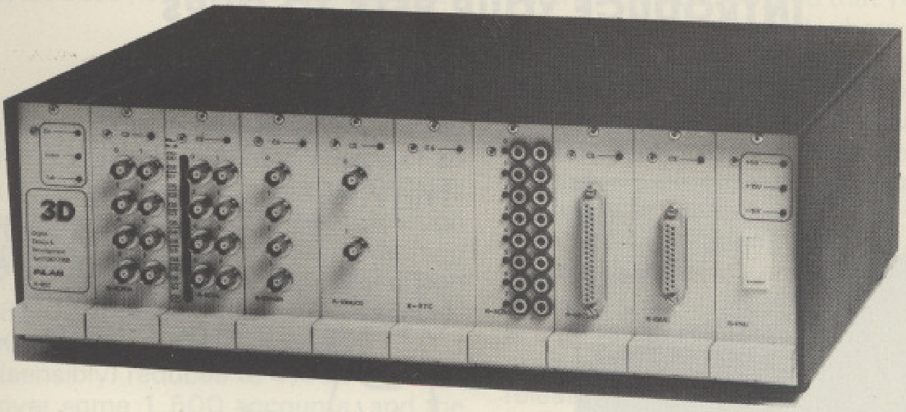
Using an operating system in EPROM, the PUSSI provides a high speed A-D Converter with 4 multiplexed inputs, which is under control of either software, or remote start/stop triggers. A-D Conversion can be carried out from Basic, or Machine Code, with up to 1500 readings entered directly into memory at a software determined rate.

CIL
MICROSYSTEMS LTD

CIL MICROSYSTEMS LTD.
DECOY RD.,
WORTHING,
SUSSEX BN14 8ND.
TELEX: 87515 WISCO G ATTMIC
TEL: (0903) 210474

Write, phone or to
obtain further information circle number

INLAB
19" RACK
MODULAR EUROCARD
INTERFACE SYSTEM



★ **Flexible – multi-channel, multi-purpose**
★ **Versatile – interfaces all popular micros**
★ **Powerful – many plug-in options**

- ☐ 12- & 14-bit A/D convertors
- ☐ Transducer amplifiers and multiplexers
- ☐ 12-bit D/A convertor
- ☐ Relays and opto-isolated outputs
- ☐ Opto-isolated BCD inputs
- ☐ Intelligent stepper motor controller
- ☐ Programmable gain amplifier
- ☐ Battery-backed clock/calendar
- ☐ Universal frequency/event counter

and now

- ☐ Function generator

3D
Digital Design and Development
18/19 Warren Street, London W1P 5DB Tel: 01-387 7388 Telex: 8953742

IEEE-488

OFFICIALLY APPROVED BY COMMODORE

Printerlink

A useful accessory that takes care of printing and frees the computer for other tasks.

One of the bottlenecks in any computerised office is the waiting period while lengthy documents are being printed out. Depending on the type of printer being used, this delay can at best be a nuisance and at worst become intolerable in a short time.

This is no better illustrated than in the case of the secretary using a word processor. Such a system tends to become the heart of the office, upon which everything else relies, and a number of 10 minute waits spread over the day take up perhaps 15 per cent of a secretary's working time.

Obviously this is not desirable, as no manager would wish to pay 15 per cent of a secretary's wages for doing (through no fault of her own) nothing at all. The system under review here offers a possible solution, although it is by no means the only one.

Most of the word processing packages available for the PET allow background spooling of files so that the central processor is freed for the next task. However, when a system has become automated around one program it can be inconvenient, and probably as time consuming as waiting for that slow printer, to make the switch to another package.

For those who cannot face making that switch, let us take a look at Printerlink.

The concept

Printerlink (£390) is the kind of unit that should have existed as soon as someone invented the microprocessor and the ability to link this up to a printer, but we had to wait until 1982 before Quality Computer Systems put this "black box" on the market.

Put simply, it is a small (23 × 22 × 7cm) box that sits between the PET and the printer, with a disk drive somewhere along the way if necessary, with its own Z80 processor and 32K of internal storage.

The box takes the output from the PET into its own RAM, then diverts it to the printer, leaving PET and disk drive to carry on word processing, calling up more programs, or whatever.

This output can be transmitted at various speeds, ranging from 300 to 19,200 baud (set by the company at your request), although the printer will continue to chug away at its usual pace; regrettably, no-one has done anything about that yet.

The QCSL Printerlink, a plug-in unit designed to add memory between computer/word processor and printer.

The important thing is, the PET is free to carry on operating.

Three different ports enter and leave the unit: one serial, which is RS 232 compatible, one parallel, which is Centronics compatible with full handshaking, and one IEEE 488 port. All three function as either transmit or receive, depending on how you set the machine up.

Three switches are situated on the Printerlink box. The first clears the machine of any data that may be in there, and emits three satisfied little bleeps to tell you it's ready for more work (when angry, it whines continuously), or simply prints out a repeat copy of the last item you sent down.

Possibilities

The other two switches determine which port you transmit on and which you receive on. Thus you could transmit IEEE and receive RS 232, or any one of the eight other possibilities this machine gives you. In other words, it can also be used as an interface adaptor/convertor if required.

Two other details you ought to know. You have three selectable options for 1, 1.5 or 2 stop bits and a similar number for even parity, odd parity, or parity inhibited.

Simplicity itself to install. We used an 8032, with an 8050 and a 3022 printer, and set up a configuration of PET to disk, disk to Printerlink, Printerlink to printer, using standard PET/IEEE cables.

Back in control

Various tests were performed: sending files down under Wordpro control and listing out lengthy programs, it coped with admirably, without any loss of data. As an example (and this was running at just 300 baud) a listing of Adventure (12¼K of Basic code) left me back in control of the PET after 17 seconds, although the printer happily chugged on for a while after that.

One complaint is that it would not operate with the old Commodore 8026 printer, which needs a device like Printerlink: it is not the fastest of printers. Instead of the text transmitted, we received garbage at the other end.

If you're wondering whether or not to buy a word processing system, buy Superscript or some other program that can do background printing.

If you already have something else, the decision is yours!

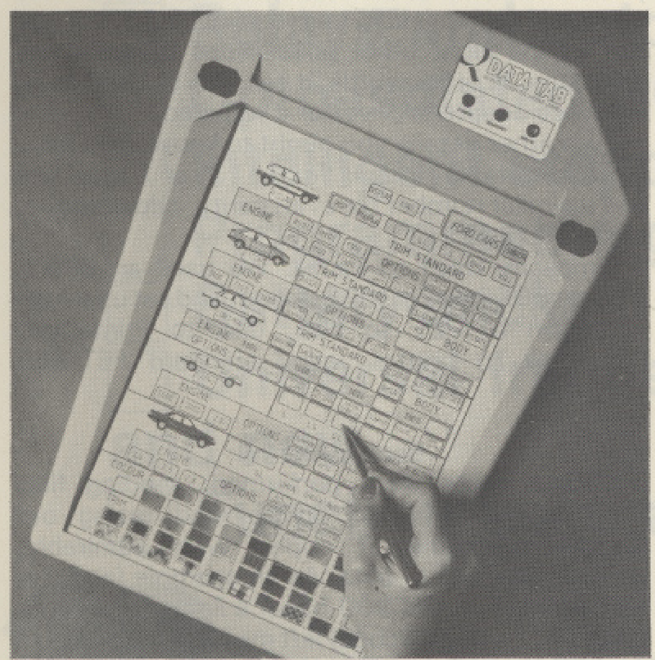
Area: *Increased printer efficiency.*
Company: *Quality Computer Systems Ltd.*
Address: *22 Hambridge Road, Newbury,*
Berks RG14 5SU.
Tel: *0635-30880.*

Data Tab

Got the programming jitters? Relax with this easy to use recording pad.

People who have never used a computer before are often worried about doing so. Invariably they are using the computer with a programme that has been written by someone else; the program may be performing familiar functions, but the method of making it perform those functions is something they are not so familiar with.

As a result a certain amount of "fear" develops: what if I press the wrong key, what if I damage the computer, what if I lose all the information I've spent the last hour typing in, and so on.



The QCSL Data Tab, a plug-in electronic data pad.

A good program should overcome all these fears, but alas, these are few and far between. Consequently, companies are forever coming up with "foolproof" data entry systems. Here we take a look at the latest of these, Data Tab from Quality Computer Systems.

The concept

This is simple enough. To persuade a user who is wary of using a computer to enter data, one must remove the computer. In its place, we need something else that can record data, and recording of data is precisely what Data Tab does.

The device connects up to the user port of the PET; others can be daisy-chained up to a maximum number of 16. Each one is individually "numbered", to be easily recognisable by the program in our host PET.

Essentially it consists of a grid of 256 boxes (now there's a familiar number!), each box being the equivalent of a touch sensitive key, rather like Clive Sinclair's ZX machines. On touching that key, a tone sounds on the device and the data is transmitted to the PET. What happens to it after that depends on the program residing in the PET.

The data in question is the location of the box on the grid. The programmer, knowing where each box lies, will tailor his program to respond accordingly; thus large amounts of data can be recorded and acted upon.

The hardware

The box measures 35 × 15 × 20cm and, on the model we had for testing, connects up to the user port on the PET. If required, you can have a full RS 232 option, running up to 9600 baud.

The maximum distance away from the mother computer is 64 metres, although whether this was for one Data Tab, or with all 16 connected, was unclear. Not having been sent 16 to review, we couldn't find out!

The size of paper it will take is A4, which fully covers the 256 square grid; each square measures 9 × 19mm. According to the specifications sent with the device, an actuation pressure of 85 to 113 grams is all that is required, but more of that later.

Like our other QCS product, it is simple enough to connect and run. One would have wished for rather better demonstration programs, however. Two short programs, while showing how the PET should read and encode the data coming in, did nothing more than print on the screen the number of the box being pressed. There should have been at least something a little more visual, to convince people of its uses.

The inevitable complaints with a device of this kind. On a number of occasions it did not detect a key being pressed, and there was a similar occurrence of one key press being detected as two, although this is easier to detect and prevent. As with Printerlink, Data Tab happily burbles at you when you've pressed a key.

Conclusion

It should find many uses in data entry environments; warehouses, supermarkets and others could make use of those 256 different boxes. But at £389, they may have to price the product lower. After all, if Sinclair can produce a touch sensitive keyboard for £49.95 . . .

Area: *Remote data entry.*
Company: *Quality Computer Systems Ltd.*
Address: *22 Hambridge Road, Newbury,*
Berks RG14 5SU.
Tel: *0635-30880.*

Matrix midgets

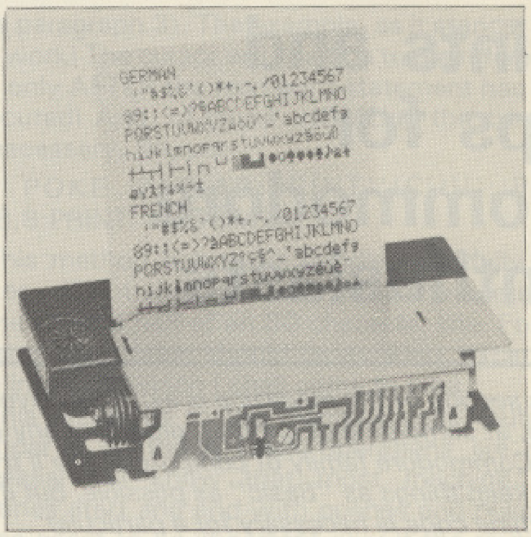
Smaller than cigarette packs, these miniature printers are tailor-made for the micro market.

Epson, one of the largest manufacturers of mini-printers in the world, predicts that the microcomputer sector will be a major growth area.

The M150 series dot matrix printers can be used with the Commodore 64 and VIC-20, with an interface to make them attractive to a wider range of users. The miniature is selling well; whether it continues to do so depends on the growth of the home computer market and on how successful Epson is in promoting the product's industrial uses. In the laboratory, for example, the M150 can be linked up to measuring instruments.

There are three printers in the series, the 150, 160 and 161. The concept of developing a small dot printer was formulated in the mid-1970s but it took Epson a few years to reach the product stage: One difficulty to be overcome was the means of execution of the printing, because of the limited technology available at the time.

The machine operates off a shuttle mechanism which is powered by four nickel cadmium batteries (it can run off the mains too) with a minimum life of 50 hours. This life may be reduced, however, if the printer is run for hours on end. There are a maximum 96 dots per line across 16 columns on the 150 compared with 144 across 24 on the 160.



The paper used for the 150 is 45mm wide, roughly the size of a shop receipt roll. The four small dot heads lie horizontally, each printing a quarter of the page width starting at the left hand corner of each character. To print one line the dot heads must pass across the width of the paper seven times — a slow process in theory, but the 150 and 161 achieve a print speed of one line per second.

The motor operates on a terminal voltage of 4.5 volts direct current, the print solenoid on 4.0 volts DC. The ribbon cassette is available in two colours, purple or black, with no dual colour ribbon available. Epson recommend that the printer should be operated in areas where the temperature does not exceed 50deg C. The model 150 weighs 60g with dimensions of 73.4 × 42.6 × 12.8mm. The 160 and 161 measure 91 × 42.6 × 12.8mm and weigh 75g and 70g respectively.

Apart from letters and numerals, the machines can print graphics provided a standard serial computer part is used. Also, if no buffer is used the computer may be too fast for the printer, causing overloading and corrupted characters; the board in the printer can be changed to allow for this.

Epson produce, for models 150 and 160, a control board called the BA 160 which prints from left to right with either parallel or serial data transfer conforming to Centronics specifications. The board also reduces power consumption. Considering that the printer retails at just under £100, it could prove to be a cost effective unit, whether used as a main or back-up printer.

More details from Epson UK Ltd, Dorland House, 388 High Road, Wembley, Middlesex HA9 6UH (telephone 01-900 0466).

Hints and tips for Commodore enthusiasts

This section of the magazine is aimed at anyone who, at some time or another, programs any of the Commodore family of computers. We'll try and keep things as "Basic" as possible, but if machine code is necessary for a particular application then rest assured that we'll tell you what is going on.

A regular feature here will be a look back at articles published in earlier issues of the magazine. No article is perfect, just as no program is ever completely finished. There's always the "Well, wouldn't it be nice if . . ." syndrome!

If you don't have the article in question, how about our back numbers service?

Let's kick off this month with a little trick to avoid endless IF . . THEN statements.

Translation arrays

Suppose you want to represent a number using a key on the keyboard. For instance, Q might represent the number 1, W the number 2 and so on. A rather bad piece of code might look something like:

```
 10 GET A$ : IF A$ = "" THEN 10
 20 IF A$ = "Q" THEN X = 1
 30 IF A$ = "W" THEN X = 2
 40 IF A$ = "E" THEN X = 4
 50 IF A$ = "R" THEN X = 8
 60 IF A$ = "T" THEN X = 16
 70 IF A$ = "Y" THEN X = 32
 80 IF A$ = "U" THEN X = 64
 90 IF A$ = "I" THEN X = 128
100 IF A$ = "O" THEN X = 256
110 IF A$ = "P" THEN X = 512
120 PRINT X : GOTO 100
```

When we are after this sort of result, it's always a good idea to see what else can be done. Look at the values of X: they are all powers of 2. Using a FOR . . . NEXT loop, we could search through a variable (call it KEY$) and then output 2 to the power of N, where N is the position of the desired key within KEY$. Our code now becomes:

```
10 KEY$ = "QWERTYUIOP"
20 GET A$ : IF A$ = "" THEN 20
30 FOR I = 1 TO LEN (KEY$)
40 IF A$ = MID$ (KEY$,I,1) THEN
   PRINT 2 ↑ (I-1) : GOTO 20
50 NEXT : GOTO 20
```

The only problem here is that as KEY$ gets longer, the search becomes a lot slower. The best way round the problem is to use what we call a translation array. This allows for expansion, it's fast (there is no searching every time, we just define our array once at the beginning of the program) and can handle every key on the keyboard.

```
10 KEY$ = "QWERTYUIOP"
20 DIM PET (255)
30 FOR I = 1 to LEN (KEY$)
40 PET (ASC(MID$(KEY$,I))) =
   2 ↑ (I-1)
50 NEXT
60 GET A$ : IF A$ = "" THEN 60
70 PRINT PET (ASC (A$)) : GOTO60
```

This could be extended to cover a number of different situations.

Sine and cosine calculations

Finding the answer to any transcendental (mathematics, not maharishi) equation, however simple (eg Y = SIN X), using computing methods is always a lengthy and difficult process. The difficulty arises from trying to choose the method that minimizes execution time and memory space while maximizing accuracy.

Most computing solutions have revolved around table-driven methods or other interpolative techniques, but these have usually suffered from an extensive use of memory and sometimes a considerable solution time.

The 18th century Scottish mathematician, Maclaurin, invented a method for calculating coefficients for series (usually infinite) which represented surds of many types, including sine, cos, log and so on.

"While working with these series recently," writes **Richard Helyer,** "I developed inversions of the sine and cosine sequences which can be used to calculate very rapidly the values of these functions for any primary value X."

As might be expected, the resulting summations still involve terms from zero to infinity, but it is a happy accident that the terms of the inversion converge so rapidly that only three or four terms are required to provide accuracy to eight or more decimal digits. Furthermore, the summations work for all values of X, even outside the 0 to 360 degrees range. For example, the absurd value 1200 could be substituted for X, but several more terms than the three previously mentioned would be required to reach the accuracy normally found in the 0 to 360 degrees range.

With X in radians, the inversion found for sine x is:

$$\sin x = \sum_{n=0}^{n=\infty} \frac{x^{4n+1} \qquad (((4n+2)\,.\,(4n+3)) \quad x^{2})}{(4n+3)!}$$

Once we know sine x, cos and tan relations follow on simply from the various well-known equations relating the three.

The sine routine that follows shows that the terms converge quickly in these series:

```
10 REM SINE ROUTINE

20 REM SET DEGREE STEP VALUE AND PRINT HEADING :-
30 FOR X1=0 TO 360 STEP 15
40 PRINT X1;"DEGREES"
50 REM CONVERT DEGREES TO RADIANS
60 X = X1 * 3.1415926/180
70 REM PRINT HEADINGS
80 PRINT "N VALUE","SIGMA","TERM"
90 REM CLEAR N AND S (S=SUM SO FAR)
100 N = 0 : S = 0
110 REM SET BOTTOM LINE CONSTANT K
120 K = 1
130 REM COMPUTE USEFUL PARAMETERS Z1 TO Z4
140 Z1 = (4*N) + 1
150 Z2 = (4*N) + 2
160 Z3 = (4*N) + 3
170 Z4 = (4*N) + 4
180 REM COMPUTE UPPER LINE OF CURRENT TERM
190 U = (X ↑ Z1)*((Z2*Z3)-(X ↑ 2))
200 REM COMPUTE LOWER LINE OF CURRENT TERM
210 L = K*Z1*Z2*Z3
220 REM COMPUTE CURRENT TERM AND ADD TO SUM
230 S1 = I/L
240 S = S + S1
250 REM ADJUST BOTTOM LINE CONSTANT AND PRINT
255 REM RESULTS FOR THIS TERM
260 K = L*Z4
270 PRINT N,S,S1
280 REM PREVENT LOOP RUNNING TO INFINITY
290 IF ABS(S1)<ABS(S*1E-6) THEN 340
300 IF S1 = 0 THEN 340
310 IF ABS(S)<1E-6 THEN 340
320 N=N+1
330 GOTO 140
340 PRINT
350 REM REPEAT FOR NEXT DEGREE VALUE
360 NEXT X1
370 END
```

Cursor positioning

Referring to an article in our October issue on cursor positioning, one of our regular correspondents, **Peter Gabor**, has the following ideas to pass on to you.

The CD$ mentioned in paragraph 2 should start with a (HME) character (CHR$(19)) to make the routine independent of current cursor position. Pokes are tricky things, especially in location 216 (see paragraph 3). The example, as it stands, does not work! The cursor will position to the referenced line only AFTER the next print statement has been executed! And, of coure, HOMEing the cursor is unnecessary. So, use

```
10 POKE 216,12:PRINT''(CU)'';:POKE
198,8:PRINT"MESSAGE
```

This method has to be handled carefully. The pokes will not work correctly if the line referenced is the second half of an 80 character line. For this reason the routine should be avoided, except for one instance which I shall come to later.

This brings us to the machine code routine. I wonder if all those stack operations are really necessary? I know that most machine code routines start and end with pushes and pulls, but these seem to be important only if the routine is part of a larger machine code program.

In direct mode and Basic nothing of importance is left in the A, X and Y registers. After RTS, CHARGET will change the accumulator anyhow.

Next, subroutine $BEF5 (check for comma) appears three times in the program, immediately preceding the evaluation routine at $C8D4. By entering this three bytes earlier at $C8D1, the routine itself will check for separators via CHARGET.

Well, it seems that 10+9=19 bytes could be saved out of the 47. I would suggest that you use them for another purpose.

Such general purpose routines should include a validity check. For instance, it should not be possible to position the cursor off-screen. One could replace the maximum permissible values with those specified if the latter exceed permitted limits. One could also jump to an error routine.

Another little detail. The routine starts counting lines and columns from zero. I prefer to reference the top left hand corner as line 1, column 1. So I suggest incrementing the X register before depositing its contents in the appropriate locations. The routine could start with:

```
START  JSR $C8D1
       INX
       CPX ##$19   ; Max no. of rows
       BCC LNEOK
       LDX ##$19
LNEOK  STX $D8
```

And so on. This brings us to "M/C behind REM statements". This technique has been used before, and I would suggest starting such REM statements with a quotation mark — CHR$(34). This will make the listings shorter, since each byte will be printed to the screen as a single character and not — in some cases — as a Basic command.

Finally, the Basic routine mentioned in paragraph two of the article. In some programs it is necessary to reposition the cursor to a previous place on the screen. This might happen after an invalid input where one might wish to print some kind of directive on the top (or bottom) line of the screen, then return the cursor. The following program should sort out this kind of problem:

```
 10 PRINT"[CD]START HERE ->";
 20 A=PEEK(216): B=POS(0)
 30 N=N+1: INPUT"MESSAGE";A$
 40 IF A$=B$ THEN END
 50 PRINT"[CD]MESSAGE IS: ";A$;
    "      "
 60 PRINT"[HME]";N;" LET'S JUMP"
 70 POKE 216,A: PRINT"[CU]": PRINT
    TAB(B);:GOTO 20
```

To round off this month, a short Basic program called Twenty Questions. It shows how, with a simple bit of Basic code, you can easily baffle everyone!

TWENTY QUESTIONS — ? — UNIVERSAL

```
100 PRINT"[HME] TWENTY QUESTIONS!"
110 PRINT "I AM THINKING OF SOMETH
    ING."
200 FORI=1TO20:PRINT"QUESTION";I;:
    INPUT Q$
210 FORJ=LEN(Q$)TO2STEP-1
220 X=ASC(MID$(Q$,J))
230 IFX>90ORX<65THENNEXTJ
240 IFX<>69THENPRINT"  ..NO":GOTO
    280
250 FORJ=1TOLEN(Q$)-4
260 IFMID$(Q$,J,5)=" THE "GOTO400
270 NEXTJ:PRINT"  ..YES"
280 NEXTI
290 PRINT:PRINT"SORRY, YOU DIDN'T
    GUESS IT."
300 PRINT"I DON'T KNOW WHAT IT IS,
    "
310 PRINT"BUT I HOPE I NEVER MEET
    ONE.":END
400 PRINT "THAT'S IT!":END
```

Does Friday give you a Monday morning feeling?

If you are responsible for payroll we can alter your life! We will make Friday the day you look forward to, rather than the day you dread.

More and more companies are finding that running their payroll is a pleasure with the payroll program that gives new meaning to the overworked phrases 'user friendly'.

The name of this program is PAYROLL 2 and it runs on the Commodore CBM 8000 and 700 computers.

We won't tell you more about it here, other than to ay, it would make very great sense to ensure you see a demonstration of this remarkable program before purchasing a payroll package. It would be highly frustrating to purchase another and then become aware of the PAYROLL 2 excellence afterwards.

*** Yes — it will assist with the dreaded SSP! ***

The price for transforming your Friday is just £375 + VAT.

FROM YOUR COMMODORE DEALER OR CONTACT:

OFFICIALLY APPROVED BY COMMODORE

LandSoft 28 Sheen Lane, London SW14 8LE Tel 01-878 7044

Setting up a study project

Robert Moscrop

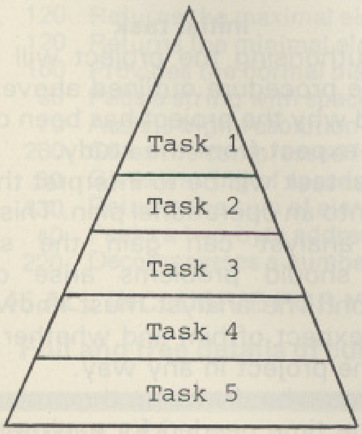
Having discussed in the first two articles in this series the nature of microcomputers and the environment in which they will be used, i.e. business systems, we can discuss the development of microcomputer-based information systems.

As a first essential we must understand the nature of our task: the systems development cycle. Certain steps must be taken from the point of deciding to computerise the accounts to the point at which an operational system is up and running. For the purpose of this article, these are defined as:

1. Project definition.
2. Detailed investigation.
3. Specifying requirements, including costing and justification.
4. Selection of hardware/software or design of a bespoke system and programming.
5. Implementation.

Item 1 is the subject of this article, the rest to be dealt with later in the series.

I am assuming that the reader is either a manager of a small business doing his own systems development, or an outside systems consultant. In both cases the approach will be the same. The systems development cycle is geometric in form and can be presented thus:



The nearer the apex, the greater the impact of decisions, hence the subsequent cost of errors. The nearer the base, the greater the commitment to the project, hence the 'patch-up' or '90 per cent' situation.

It is the responsibility of the manager to define the project and terms of reference before any study commences. The definition must not be vague and should take into account a number of factors:

1. The nature of the problem should be clearly set out, with the reasons for its existence. These may be modified as the study progresses.
2. The study should proceed according to an agreed plan and timetable, with enough resources in terms of manpower and calibre allocated.
3. In defining a project, managers must realise the size of the job to be done, be prepared to participate in it and give it their authority by obvious support.
4. Managers must be prepared to treat those doing the analysis with respect and to reveal appropriate information of a confidential nature. This includes the terms in which the proposal will be judged and the anticipated investment return or profit ratio.

It is the manager's responsibility to define the project and terms of reference before any study commences

Boundaries of the study

The need for all parties involved to understand the objective of the study and its possible implications cannot be too strongly emphasised.

Managers must be aware of what they will have to support, while analysts must know what is required of them in order to employ the appropriate techniques.

The objectives of the investigation may be summarised in the following types of study:

UPLIFT	This is the most restricted form of study in which the procedures remain unchanged, equipment being applied to speed up the operations.
CONSTRUCT	In this case an information system is constructed

Robert Moscrop, director of Computotech Ltd, is a widely experienced systems analyst and designer. Since 1978 he has been developing training systems for the Manpower Services Commission and working as a consultant.

	based upon the business objectives of the company and the resulting systems requirements, at the same time determining how procedures will be performed.
RECONSTRUCT	This is a combination of the foregoing, in which the present procedures are modified prior to considering how it is to be performed.
RE-ORGANISE	In terms of manpower, function and departmental boundaries. This type of study requires the authority, expertise and experience of a business analyst.

The analyst must know what the managers expect of him and whether they have modified the project in any way

Having identified the basis of the study, it is possible to examine the problem area. Traditional approaches to systems development often result in the allocation of wrong priorities, leaning too heavily on the expertise of existing staff. Definition of the problem area involves:

IDENTIFICATION	The people and departments to be studied.
ENVIRONMENT	Reasons for the problem.
CONTROL	Levels of control which cannot be changed by any proposal, e.g. internal or external legislation, trade agreements and practices.
TIME-SCALE	The sequence in which steps will be taken and the time allotment.

Justification

The basis on which managers will view any proposal must be clearly defined, and the way in which proposals will be calculated and expressed.

Benefits can be expressed in the following terms:

FINANCIAL	a) Reduction in administrative costs. b) Reduction in operating costs. c) Increase in profits.
RESOURCES	a) Performing the same administrative procedures by replacing people with machines. Transferring workers to more profitable areas. b) Redirecting financial commitments into more profitable areas. c) Eliminating capital commitment.
SERVICE	a) Existing operations can be improved. b) Planning can be more effective.

Systems projects often fail because of lack of definition. The objectives can be summarised as follows:

Identifying the Project
a) Objective b) Boundaries c) Constraints
Involvement
a) People b) Departments
Reporting
a) Structure b) Form c) Frequency
Resources
a) Time b) People
Costs

Initial task

Those authorising the project will have been through the procedure outlined above. They will understand why the project has been chosen and what they expect from the study.

The initial task will be to interpret the terms of reference into an operational plan. This is the only way the analyst can gain the support of managers should problems arise during the investigation. The analyst must know what the managers expect of him and whether they have modified the project in any way.

The person who draws up the project plan will estimate the time needed for each task, specify the sequence of tasks and consider the number of people available to help with the project. Such a plan helps the analyst to meet deadlines and stick to his budget.

Next month
Robert Moscrop considers the techniques for recording the results of the study project.

Does your PET need a new chip ? You need a SOFTCHIP !

Write professional quality software. Save money and perhaps earn some !
YOU NEED SOFTCHIP.

As sold to Universities, Industry and Professional Software Houses. Our routines cut development time by half, increase normal disk capacity by a factor of three, the list goes on and on ! Harness our machine-code from your Basic programs using simple Basic commands like :

APPROXIMATE MEMORY USAGE

AUTO	40	Provides automatic line numbering.
BEEP	80	Plays music of given duration and pitch.
BLOAD	40	Loads in a block of memory without affecting BASIC execution.
BSAVE	120	Saves the memory area between two given addresses.
CALL	80	Enter a machine-code subroutine with given Acc,X- & Y-reg.
CIF,CEND **ELIF,ELSE**	220	Four commands which provide facilities for structured BASIC, largely eliminating the need for the GOTO command.
CURSOR	30	Places the cursor at position x,y on the screen.
DATIN	690	Foolproof input routine for dates with full error detection.
DELETE	70	Deletes a given range of program lines.
DISABLE	50	Disables the run/stop key without affecting the internal clock.
DISP	140	Displays a prompting or warning message on a given line.
DREAD	100	Reads data from disk without input restrictions.
DSEARCH	330	Searches a disk relative-file for a given string or pattern.
DUMP	170	Outputs the names and values of all current scalar variables.
EDIT	70	Adds 'delete-forwards' function.
EXEC	140	Executes a string as a BASIC command.
FIND	200	Lists all lines in which a given character string appears.
GENIN	700	General foolproof input routine with selected key disablement.
GSUB	110	Performs a GOSUB to a given labelled line.
GTO	90	Performs a GOTO as above.
INPUT	40	Allows a program to continue despite a null entry being input.
INVERT	160	Turns a string back to front.
IRQ	60	Restores normal system use of interrupts.
KILL	20	Takes out SOFTCHIP commands.
LINES	50	Calculates the number of lines in a program.
LWIND	170	Loads a screen display from a compressed format file.
MERGE	360	Merges a program from tape or disk into the current program.
MON	10	Enters the CBM machine-code monitor.
MOVE	130	Moves a block of memory to another position in RAM.
NUMIN	740	Foolproof input routine for amounts of money.
PCTRL	100	Set the device number and characteristics of the printer.
PLOT	170	Plots a double-density point on the screen.
POP	30	Removes the last subroutine return address from the stack.
PRINT	130	Adds routine to automatically right-justify amounts of money.
PRINT	280	Modifies all printer-output as needed and adds TAB function.
PUSH	60	Pushes a return address onto the stack.
RENU	930	Renumbers a program, altering all GOTO's, THEN's, etc.
REPEAT	50	Adds repeat key function.
REPLACE	490	Replace all occurrences of one character string with another.
RESCUE	40	Recovers a program accidentally 'NEW'ed.
RESET	170	Resets a double-density point on the screen.
RESTORE	20	Restores DATA back to a given line number.
REVERSE	50	Reverses the field of the screen.
SCAN	190	Scans a string for the next occurrence of a given character.
SCOPY	340	Copies the screen to the printer.
SCROLL	230	Scrolls screen contents up,down, left or right.
SEARCH	270	Searches an array for a given string or pattern.
SHRINK	180	Removes all unnecessary spaces and 'REM's from a program.
SORT	760	Sorts any one-dimensional array (and tags another array along)
SWAP	440	Loads in another program, retaining all variables.
SWIND	150	Saves the contents of the screen in a compressed format.
TRACE	110	Displays the last six line numbers at the top-right screen.
VAR	390	Outputs the names of all variables referred to in a program.
WINDOW	30	Sets top, bottom, left, right for an 8032 screen window.
WPOKE	50	Pokes two memory locations in hi-lo 6502 order.

★ ★ NEW COMMANDS NOW AVAILABLE

BORDER	100	Draws a border around the edge of the screen
CLOCK	250	Continually displays the time at a given screen position.
GRAPH	20	Gives access to the box-drawing characters on an 8032
ON	50	Branches to program line corresponding to key pressed.
PROTECT	90	Allows regain of control after system crash.
STATS	120	Outputs the number of statements in the current program.

★ ★ NEW FUNCTIONS which may be used in any expression

AVG	140	Calculates the average of the elements in a numeric array.
BLANK	40	Tests a string : returns true if the string is blank.
DEC	80	Gives the decimal equivalent of a hexadecimal number.
FACT	60	Provides the factorial function.
GAMMA	90	Provides the gamma function.
HEX$	90	Gives the hexadecimal equivalent of a decimal number.
MAX	120	Returns the maximal element of an array.
MIN	120	Returns the minimal element of an array.
NORM	160	Provides the normal distribution area function.
PAD$	90	Pads a string with spaces.
QUME$	70	Assists high-resolution plotting on QUME Sprint 5 printer.
SHR$	260	Gives the compressed form of a number for compact storage.
SPC$	30	Gives a string of spaces of given length.
SUM	130	Returns the sum of elements of an array.
WPEEK	40	Peeks a two-byte address.
XPD	220	Decompresses a number.

ONLY £45 ALL INCLUSIVE FOR YOUR CHOICE OF 3700 BYTES

Full and free details of current library of SOFTCHIP commands available.

HERE'S HOW TO ORDER

(1) Choose around 3700 bytes worth : the number of bytes is beside the name.

(2) Write your selections in order of preference - this is important as our numbers of bytes are only approximate.

(3) State which of these computers you have : New Roms, Basic 4, Fat 40, or 80-column : and also which socket you would like the chip to reside in (we will choose if you wish us to).

(4) Send order direct to us at the address below,giving a day-time telephone number, together with remittance for £45.00 incl. VAT & p/p for each new chip.

We take orders over the phone from government organisations.

plus: *Whitby Basic* ..£99.00 incl.........a revolutionary new disk-based language for the Commodore range which is as big a step forward as electric light was from candles.......this is the language the PET should have had when it was introduced ! Get details now from your nearest Commodore dealer or direct from

WHITBY COMPUTERS LIMITED, 8. Chubb Hill Road, Whitby, North Yorks.
Telephone 0947-604966 or 604968

What will they think of next ?

If it came to the worst you'll be glad you went to the best.

Mills Associates
Computer
Maintenance Services
commodore
CBM
Model 8096

If your computer develops a fault chances are that it will happen just when you can least afford the interruption and downtime. So you'll want fast and effective action. That's where Mills Associates comes in.

Mills are the only independent maintenance company recommended by Commodore to provide comprehensive engineering services throughout the United Kingdom.

Through Mills you have access to a range of preventative maintenance and fault repair services backed by a network of 10 engineering centres and over 15 years experience in computer engineering.

Full maintenance contract

This is designed for users for whom a minimum of downtime is essential. The service includes two routine maintenance visits each year and a call-out service with 24 hour response and fix times. Replacement loan units for standard equipment are available at no extra cost and the annual contract charge includes all replacement parts, labour, travelling and so on.

Fault repair contract

If break-neck speed is not essential then Mills' low-cost fault repair service is the answer. This provides for call-outs on a 72 hour response basis and as with the full maintenance contract, all costs are included in the annual charge. Similarly, replacement loan equipment is available at no extra cost.

Ad-hoc repairs and upgrades

For occasional repairs and upgrades Mills offer a first class workshop service and will collect, repair and deliver Commodore units anywhere within mainland Britain at fixed rates.

Remember, Mills Associates are the only independent maintenance company recommended by Commodore, so if it comes to the worst be sure you go to the best.

For immediate action call Mills' head office on 0600-4611. Alternatively, use the coupon to obtain further information about the service that will best meet your needs.

I'd like to know more about the following services: (tick as required)

- ☐ Full maintenance contract
- ☐ Fault repair contract
- ☐ General repairs and upgrades

Name (Mr/Mrs/Miss) ____________________

Address ____________________

____

Telephone ____________________ MA/CCO/0383

To: The Commodore Information Centre
675 Ajax Avenue, Slough, Berks SL1 4BG.

commodore
Changing business for the better.

Taking the grind out of workshop routines

The word "epic" is commonly used of films and books. But a computer system? Yes, and researchers at The Computer Room in Tonbridge, Kent were not being pretentious when they called one of their software packages EPIC. The letters stand for the Engineers Production Information Control system, designed to work on the 8000 series.

The system has considerable potential for helping firms to plan and check most aspects of production.

Although it is designed basically for engineering firms, the system could be adapted to the needs of a firm producing, say, safety pins or cardboard boxes. The system covers 30 operations. One of the programs, Estimated Method, was dropped from the system when customers found it to be not very useful. Which is hardly surprising when you consider that there are two other programs concerned with work methods, namely Method File and Current Method.

The Computer Room

The Computer Room

The Computer Room

The list of operations available can be called up by pressing 0 for operations. Once the required operation has been found, the appropriate number has to be keyed in. On the Method File, only two items of information are compulsory — the part number and the customer part number. Then, if the operator wants to access the part number, all he has to do is call up the customer number. The rest of the screen can be used for information which is user definable, for example a description of the part, the batch size and the raw materials needed to make the item.

Two programs, Order Book & Backlog Details and Order Book & Backlog summary, help the company to process and check orders. When an order comes in a job card is allocated to it which details the firm-to-customer requirements such as the date the order arrived, the due delivery date and the priority for the job, which is determined by working from the delivery date backwards to sequence the order of the jobs and the number of days or man hours required to complete the work.

To make this clearer, an example. Two orders for the same item are received on the same day. Whereas job number one is due to be delivered in seven days time, job number two is not due for delivery for another 12 days; clearly job number one will be given priority. The job card can also include a list of the jobs which have not been done and produce a list of jobs which need to be performed during the day.

As every businessman knows, keeping up stock levels is important. EPIC covers this aspect of production too, with a Raw Materials Stock List, Raw Materials Movement, Stock Levels Summary and Raw Materials Code List.

Calling up any of these operations will not give you the name and address of the supplier or the customer, but these can be obtained via the part numbers. On the Raw Materials Code List, each stock of raw material is given a material number and a reference number which refer to the specification, size and production methods for each material. The code list also features the part number, the number of parts per unit and details of special requirements, for example painting and heat treatment.

For each factory machine a specified running period can be fixed to allow time for maintenance and breakdowns.

Between the Raw Materials Code List and the Raw Materials Stock List there is little difference expect that the latter includes, along with the part number and parts per unit, a column for the total number of parts in stock. Companies using the stock list may thus find the code list unnecessary.

Ledger account

The Raw Materials Movement program is rather like a ledger account; it gives the amount of material that comes in, the amount that goes out and the balance. At the touch of a button, it becomes clear which raw materials need to be stocked up.

Each job presents its own problems, its own special requirements. What happens if the production process is held up for a day? When the job description is printed on the screen the operator will also be told how long it will take to set the job up and how long to complete the job. So if you find

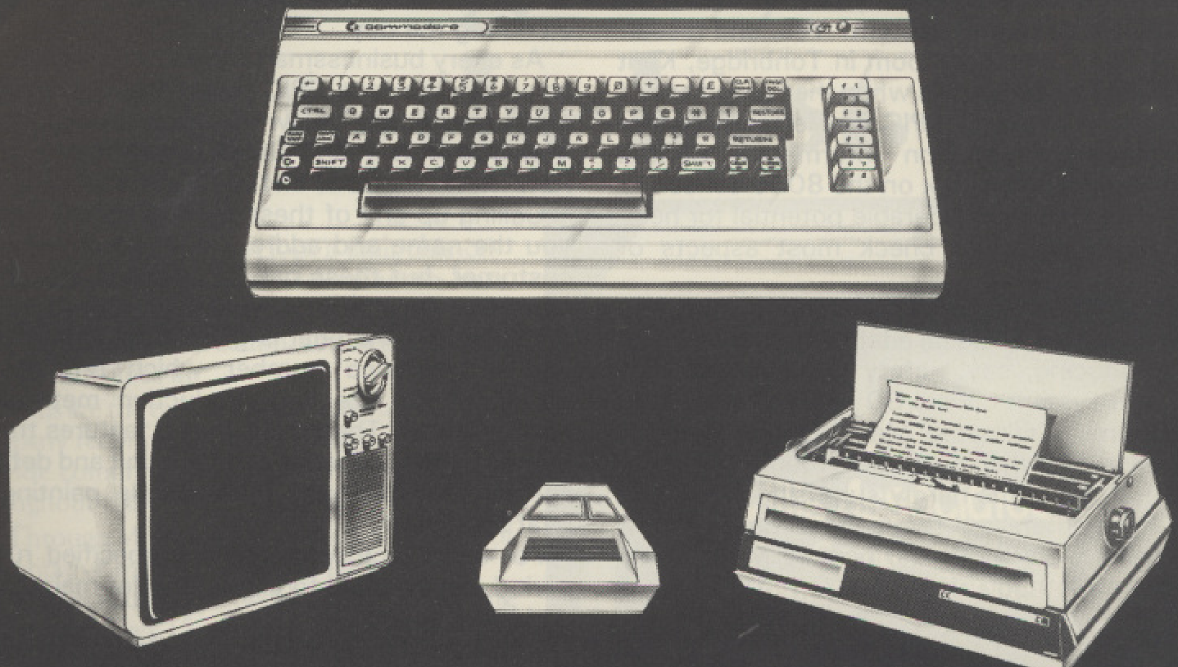
Method file

Part no:	P100	Issue:	2
Cust part no:	123/25-12	Date of issue:	Jan 82
Description:	Rotor shaft	Issued by:	
Customer:	Ford	Raw material —	
Cust. ref:	998/22	Spec:	SAE 1099
Cust. latest issue:	FO 69-52/12	Size:	5/16 in
Batch size:	100	Condition:	cold draw
Tins per batch:	2	Heat treatment:	'V'
Parts per unit:	369	Other req:	10/20 HB
		Bar lengths:	10-12
		Ref No:	R100

WORD PROCESSING

For under £1000.00

Training included. Price ex. VAT



One of our customers wanted a word processor with a daisy wheel printer and screen editing that was simple, easy to use – viable for one fingered typists and yet having the ability to make his best typists work look more professional and, of course, at a reasonable price.

After careful selection we came up with a system that gives access to all the letter quality printer features, in fact it provides all of the advantages of a truly professional word processor.

So successful has this system been that we have added additional work stations for him at under £500.

Why don't you ask for a demonstration today?

ALPHA
Business Systems

Electron House
Industrial Estate
Church Street
WARE, Herts.
SG12 9YA
Ware (0920) 68926

MARCH 1983 50p

Home COMPUTING

THE SMALL COMPUTER SUPPLEMENT TO COMMODORE COMPUTING INTERNATIONAL

News

Handy home printer that tests itself

Alphacom, winners of an Industrial Design Award for their printer housings, have introduced a 40 column printer/plotter called the VP42, for use with the VIC-20 and 64. It connects via an interface which they supply with the printer and has an output speed of 80 characters per second.

The printer, which is currently available by mail order only, is aimed at the home computer market and comes with a built-in self testing program which also tests the Commodore graphics, as well as a cassette tape and a book of ready-to-use programs. To use the self test program, all you have to do is press down the paper advance key, switch on the power and the printer will output a series of 8s. Release the paper advance and the unit prints out both the graphic and alphanumeric sets of characters on a 5 by 7 matrix.

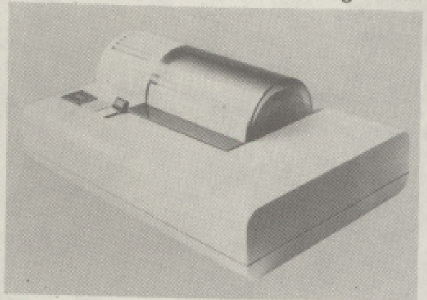
When you buy the VP42 from Alphacom, you get more than a mere printer. The package includes a six-program cassette and a book full of games. The printer's not bad either.

The cassette tape has six programs including a menu and two games, one called Kaleidoscope and the other Sketchpad. Along with these come a word processor program, record program and screen printer program. The book, which sells in America for $12, has a comprehensive mixture of games and educational programs.

The VP42 was designed in America. Its first official showing in Britain will be at the Commodore Computing Show on February 26.

The price of £137.99 includes interfacing, tape and book.

Available from Dean Electronics Ltd, Glendale Park, Fernbank Road, Ascot, Berks (telephone 0344-885661, telex 849242).



VP42 printer from Alphacom

Money manager

Following the success of VisiCalc, Supersoft have come up with another business program, BusiCalc, which can be used for cash flow forecasting and household finances. The size of the worksheet is determined by the number of rows and columns. Each sheet can take a maximum of 90 rows, the number of columns being limited by two factors: the capacity of the machine being used and the width of each column which can be anything from 5 to 18 characters wide.

Any area of the sheet can be replicated into other areas, a useful step for calculations using a repetitive formula. Figures can be rounded up or down to so many decimal places subject to the limits imposed by PET Basic.

The product comes in a tape format for both the PET and the VIC, the VIC requiring at least 16K expansion. It costs £39 plus VAT. (for programs on disc, add £1.50). Supersoft supply about 200 Commodore dealers; you can also obtain the program direct from the manufacturer Winchester House, Canning Road, Wealdstone, Harrow, Middlesex HA3 7SJ, (telephone 01-861 1166).

Contents

News 1

Alphacom's VP42 printer for the home computer market comes with a built-in self testing program.

After Visicalc, Busicalc, designed to help you manage your household cash.

Software review 3

Computer versions of arcade games predominate in the latest crop of Fun software.

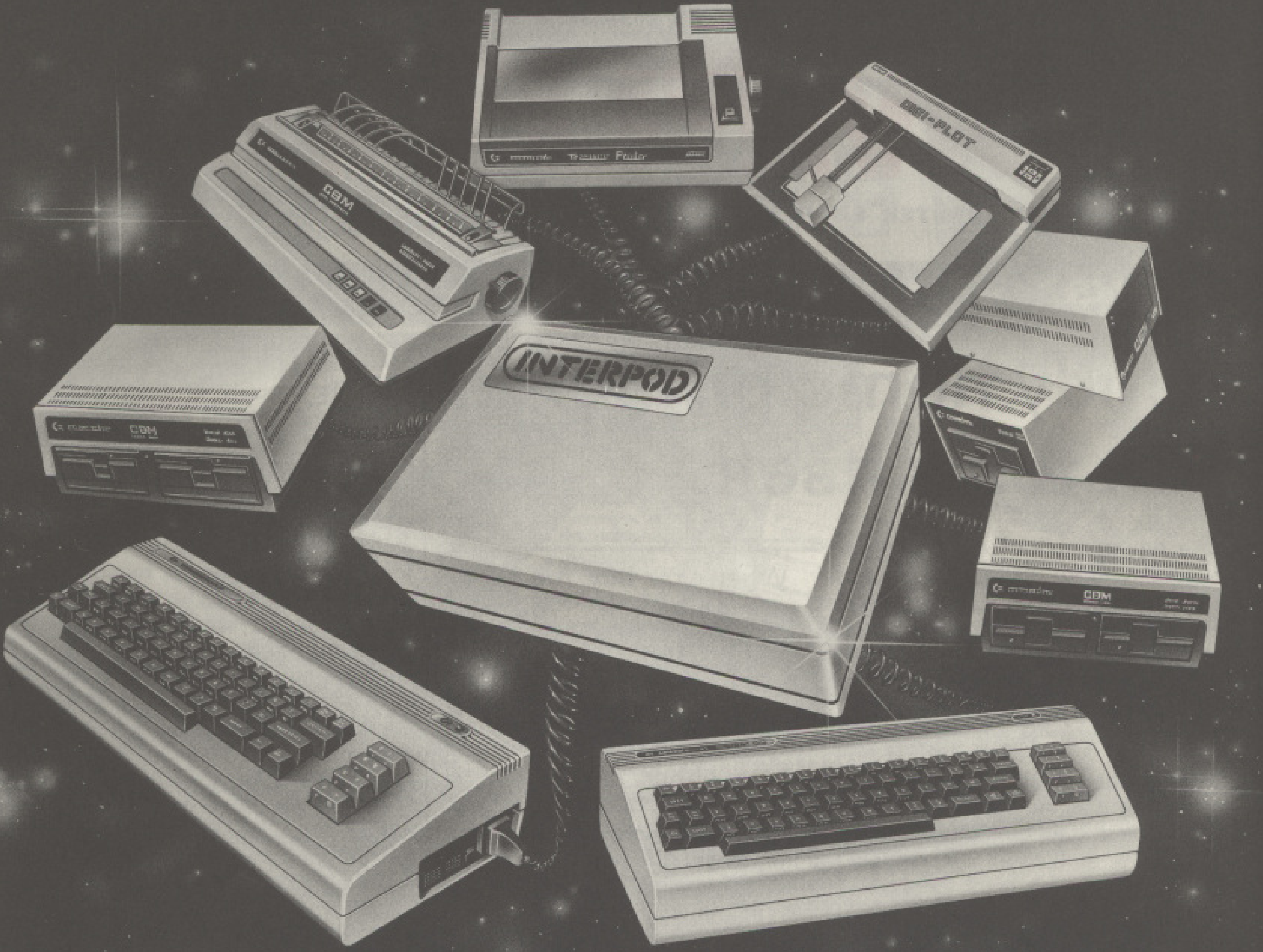
Adventure games 6

Will o' the Wisp pits the player against Ralph the Great Magician.

Basic programming 20

Breakout and Bandit 1 for the VIC-20.

Now the VIC 20 and 64 can communicate with PET peripherals



VIC and 64 users

Would you like to be able to access **any** of these peripherals from your computer?

- ⅓ megabyte disks (Commodore 4040 drive)
- 1 megabyte disks (Commodore 8050 drive)
- 10 megabyte disks (Commodore 9090 hard disk)
- Printers including a wide range of inexpensive IEEE and RS232 matrix and quality printers
- IEEE instruments such as volt meters, plotters etc.

Now you are no longer limited by the VIC or the 64's serial bus. Simply by attaching INTERPOD you can vastly increase the power of your VIC 20 and when used with the new 64, INTERPOD turns the computer into a really powerful system.

With INTERPOD the VIC and 64 become capable of running really professional quality software such as Word-processing, Accounting, Instrument control and many more.

INTERPOD will work with any software. No extra commands are required and INTERPOD does not affect your computer in any way.

Using INTERPOD is as easy as this:

Simply plug INTERPOD into the serial port of your computer, power-up and you are ready to communicate with any number of parallel and serial IEEE devices and any RS232 printer.

INTERPOD costs £125 + VAT

INTERPOD

Oxford Computer Systems (Software) Ltd. The Old Signal Box, Hensington Road, Woodstock, Oxford OX7 1JR Tel. (0993) 812700

Variations on a theme of aliens and centipedes

Arcade games are not what they used to be. Nor are their derivatives, the home computer cartridges. Space invaders, asteroids and base ships have given way to the Zymwatts, the evil Tharg and the dreaded Night-Crawler.

An official release from Commodore tells us that over a million VICs have been sold worldwide. This means that over a million potential programmers are out there, writing programs for possible future release. Does the quality of the packages that are currently on sale reflect this vast amount of programming talent?

We've selected four suppliers of games software, and here we take a look at some of their offerings.

Games Pack

Melbourne House are a small but growing company producing VIC games software. An office in Nashville, Tennessee, would suggest a country flavour to their games, but alas we have to contend with the usual mixture of space age death and destruction.

The Melbourne House Games Pack comes in at £5.95 and features five games for the standard VIC. Mostly written in Basic, but three of them do feature a spot of machine code when the going gets tough. All of them are written by Clifford Ramshaw, author of *Innovative VIC Programming*, and his style certainly shows through.

The opener, *Alien Blitz*, is a version of the one-time arcade favourite *Galaxian* (*Invaders*, but with enemies that peel off in formation). Once you've recovered from the incorrect instructions on the accompanying slip of paper, you can manoeuvre your ship left and right, and fire, but not both at the same time. This game, like the next three, suffers from being dreadfully slow.

Invaders is *Invaders*. Is there anything new one can do to this game?

Ground Attack is a version of *Scrambler*, although it only presents one screen at a time. As usual it is slow, and it is not the easiest of tasks trying to control six different keys as various missiles and rockets assault you from all sides. If it was more faithful to the original game and allowed you to travel off the screen it would be reasonable, but as it is . . .

Storm is the only bit of original thinking, in that it is not based on an existing arcade game and has some engaging features as you try not only to shoot down alien spacecraft but also to net them! Yes, you've got to go fishing for aliens. Good fun.

When you figure out the controls for *Space Rocks* you'll soon realise that this game is the pick of the crop. Faster than the rest, it is based on *Asteroids* and is a fairly good implementation. Definitely the best one.

For £5.95 this cassette represents reasonable value for money. They all work on the standard VIC and even if they are slow they should provide amusement and inspire you to do better.

Company: Melbourne House Ltd.
Address: Glebe Cottage, Glebe House, Station Road, Cheddington, Leighton Buzzard, Beds.
Tel: 01-405 6347.
Comments: Standard VIC, individual games poor, but overall value for money.

Outworld

Whoever does the write-ups for the Audiogenic games packs certainly has a vivid imagination.

In *Outworld* you are defending the "hub of a mining colony on a distant planet". The lights of the city have been faithfully reproduced here, and there is neat use of the VIC's graphics in displaying the image of a future city.

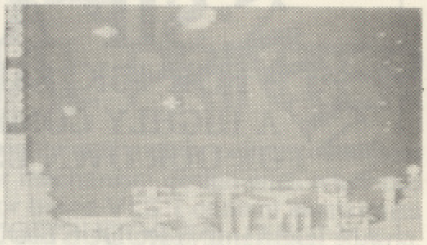
You have to defend this city from your laser base, stopping the mysterious alien invaders from dropping bombs on the city. Meteorite showers are apparently a way of life; you also have to stop those getting through the security force field that surrounds the city.

The force field uses up vast amounts of energy, and every time you stop an alien ship you also consume energy. How is this replenished? A fuel ship appears from time to time to top everything up, and you have to secure a safe passage through the deadly skies.

If the ship is destroyed, an alien bomb or a meteorite gets through; the city, and the game are lost.

Beautiful graphics and fast action make for a compelling game. Individual games don't last very long, but perhaps that was just my inexperience in defending mining colonies. It is certainly addictive, but whether it is worth £19.95 for the cartridge depends on your bank balance.

Company: Audiogenic Ltd.
Address: PO Box 88, Reading, Berkshire.
Tel: 0734-586334.
Comments: Standard VIC, joystick, excellent graphics.



Outworld

Krell

According to the press release, you have to defend the Zymwatts against the evil Tharg and his energy bolts.

Interesting, you might think. Unfortunately it's just another game of *Invaders*, with a twist or two in the tail. As usual there are several ranks of aliens bobbing about the screen, with the evil Tharg traversing the top of the screen and dropping the occasional energy bolt at you as he does so.

Two-thirds of the way up the screen is a "breakout" type of wall, housing a few more aliens, who also fire at you periodically. You have to destroy the wall as well as the aliens, and shooting the evil Tharg rewards you with a new set of invaders.

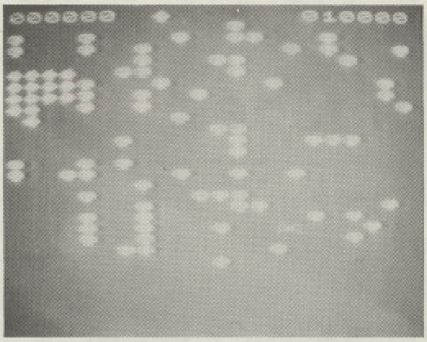
Night-Crawler

Otherwise known to arcade fans as *Centipede*, this, like *Krell*, comes from a company called Rabbit Software and is also priced at £9.99.

Of the eight games we've mentioned so far, this is the sixth to be based on an existing arcade game. Doesn't anyone have any imagination any more? It is reasonable to assume that a popular game in the pubs will prove to be a best-seller in the home, as long as you produce a good enough facsimile, but there must be other games that people could invent.

The screen is populated with mushrooms. To begin with, you're down at the bottom, but you can move up a few inches when evasive tactics become necessary. From the top appears the centipede after which the game is named, and it gradually makes its way down the screen towards you. Every time it hits a mushroom it moves down another row.

Unlike a real centipede, this one has mastered the art of segmenting itself, so little bits of it range around the screen as well: it is these that you must shoot down in order to survive. Clear one whole centipede and another one comes at you, more frantic than before.



Night-Crawler

Company: Rabbit Software Ltd.
Address: 380 Station Road, Harrow, Middlesex HA1 2DE.
Tel: 01-863 0833.
Comments; Works on a standard VIC; check each one out first, though, as quality ranges from good to indifferent.

Mission Impossible

Scott Adams has written a series of Adventure games for the VIC (and the PET). This is the third in the series. You have to pit your wits against a saboteur in a race against time, to stop a time bomb from detonating in a nuclear power station.

Otherwise it's just like any other Adventure game. I don't like having to type L after every move, to see where I am and where the exits are; you should be told this as a matter of course. Still, it's interesting to try and solve it all, and should keep you occupied for many a happy hour. I still prefer Jim Butterfield's PET Adventure.

Company: Commodore Business Machines.
Address: 818 Leigh Road, Trading Estate, Slough, Berkshire.
Tel: 0753-73638.
Comments: Cartridge, £24.95. If you must buy a Scott Adams Adventure, stick to the first one.

NEW!

SIP ACCOUNTING SYSTEM

FOR 16K, 24K, VIC20 & PRINTER: 40 col VIC20; CBM 64

A HIGHLY COMPREHENSIVE ACCOUNTING PROGRAM DESIGNED FOR OUR OWN USE BUT SO GOOD WE THINK EVERYBODY SHOULD USE IT!

AN IDEAL INTRODUCTION FOR YOUR STAFF OR YOURSELVES TO THE WORLD OF COMPUTER ACCOUNTS.

FEATURES INCLUDE:

MENU DRIVEN — SIMPLICITY TO USE!
UNLIMITED NUMBER OF ACCOUNTS
NOMINAL LEDGER
SALES AND PURCHASE LEDGERS (OR JUST ONE TYPE)
STATEMENTS PRINT (FOR ALL OR JUST ONE COMPANY)
OVERDUE ACCOUNT STATEMENTS (AS ABOVE)
CASH SUMMARY — DEBTORS & CREDITORS
END PERIOD CARRY ON TO NEXT DATA TAPE
INFINITE No. OF VAT RATES AND MANY EXCELLENT FEATURES!
ALL IN ONE PROGRAM:

NOT A TOY

REQUIRES: PRINTER +

16K	**(130 + INVOICES)**
24K	**(350 + INVOICES)**
40 col + 24K + 3K	**(500 + INVOICES)**
CBM 64	**(750 + INVOICES)**

TAPE & MANUAL £24.95 + VAT

S.I.P ACCOUNTING SYSTEM PRINTOUT DATE 01/01/83

SALES LEDGER ANY LTD STATEMENT

INV.	DATE	DEBITS	CREDITS
CHEQ.	01/01/83		00065.00
2	01/01/83	00132.08	
1	01/01/83	00141.45	

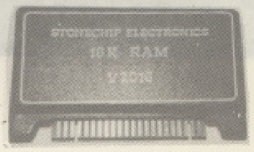
TOTAL BALANCE £00208.53

SPECIFY MACHINE WHEN ORDERING.

SHORE INDUSTRIAL PLASTICS LTD
1-13 CORSHAM ST. LONDON N1 6DP
TX: 943763 REF. SHAMAH.
Tel: 01 250 1978

COMING SOON —
OUR 1515 ACOUSTIC COVER!

afdec ELECTRONICS LIMITED



16K RAM FOR **VIC-20** (V2016)

Increase your VIC 20 to 19967 useable bytes with our massive 16384 Random Access Memory Pack

* No additional Power Supply needed
* 12 Month Guarantee Parts and Labour
* Compatible with available Motherboards
* Plugs into rear of Computer or directly into Motherboard
* Switchable to 3K, 8K or 16K
* Tough, attractive Custom Made Cartridge Case (140 x 80 x 18mm)
* No Re-addressing of existing Programs needed
* Made and designed in Britain

£44.50 incl VAT & P&P

ALSO TANDEM
(Expandable Expansion System)

* Gives 3 + 1 Expansion Slots for Vic20 Cartridges
* Custom Made Case
* Plugs directly in Rear Expansion Ports of your VIC20
* No additional Power Supply needed
* Further expansion by using Tandem System
* ROM Socket for more expansion

£34.95 incl VAT & P&P

POWERED TANDEM COMING SOON

Send Today. Cheques P.Os to
AFDEC ELECTRONICS LTD,
318 Kempshott Lane, Basingstke, Hants. RG22 5LT

Prices include VAT and P&P

Please print clearly. Please Supply

..........VIC20 16K RAM PACK	£44.50
..........VIC20 20 TANDEM SYSTEM	£34.95

Name ....

Address ....

....

Allow approx 14 days for delivery.

THE PROFESSIONAL ONE
COMMODORE THERMAL PRINTER

£119.99
Please add £17.99 to cover VAT (total £137.99). Allow max. of 28 days for delivery.

The Computer Printer high speed matrix printer combines contemporary printer mechanism design with advanced microprocessor based VLS I control electronics and distinctive functional styling.

- ■ 40 column 80 character/sec. line printer.
- ■ Attractively styled durable housing.
- ■ Interfaces to VIC 20 & VIC 64.
- ■ Quiet operation.
- ■ Full Commodore graphics.
- ■ Uses Olivetti dot matrix thermal print mechanism.
- ■ Low cost thermal paper supply.
- ■ Tested and approved by COMMODORE.

PRICE INCLUDES:-
Commodore to Printer interface cable. Cassette tape of graphics programs. Comprehensive book containing ready-to-type games and educational programs. One roll of paper.

dE COMPUTER PRINTER DIVISION
DEAN ELECTRONICS LIMITED
Glendale Park Fernbank Road Ascot Berkshire England
Telephone 0344 885661 Telex 849242

Will o' the Wisp

Mark Capella

Something of a departure from the norm for Basic Programming this month. As the rest of the magazine is packed full of programs, ideas and hints, we thought we'd bring you a rare treat with this fabulous 32K adventure program from Mark Capella.

Written entirely in Basic (although you'd never know it from the speed of action) this humorous game will work on any machine with a minimum of 32K of RAM, provided you are not too offended by slightly strange screen layouts on machines with more or less than 40 columns.

VIC users will have to bear with it, unless you've somehow acquired a 40 column screen for yourself. 80 column users can always POKE 226, 40 to get a 40 column window on the right hand side of the screen. Press HOME twice to escape by the way, if you're not too familiar with window settings.

Anyone else, *including the new 64 owners*, should have no problems.

The game

It is the day before your marriage to the kind and beautiful Brunhilde, and in an attempt to discover the meaning of life you've decided to explore the large forest around your shack.

Hidden deep in the forest is a cave, and when you've found it, your adventure really begins.

There you have to do battle with trolls, witches and Ralph the Great Magician! The game unfolds before you as you go on, exploring caves and tunnels and twisty tracks in an effort to solve all the problems.

Having just been eaten by a troll, I'm not going to give you any hints at all. Just have fun as you prepare to play 'Will O' The Wisp'.

Will o' the Wisp is available on cassette tape, price £5 or on disk, price £10. Please state machine type when ordering from:– Nick Hampshire Publications, P.O. Box 13, Yeovil, Somerset.

```
2 GOTO6
4 PRINT"WELL I'LL HELP YOU ALRIGHT... I'LL ";:RETURN
6 CLR:GOSUB8:GOSUB54:GOSUB86::END
8 Y=10:F=20:G=30:H=40:R=50:J=60:K=70:L=80
10 REM
12 PRINT"▒▒▒▶▶▶▶▶▶▶▶▶▶▶▶▶▶WILL '0 THE WISP"
14 PRINT"▒▒▒▶▶▶▶▶▶▶▶▶▶▶▶▶▶BY  MARK CAPELLA"
16 PRINT"▒▒▒▒▒▒   YOU ARE A POOR COUNTRY BOY WHO IS
18 PRINT"DESTINED TO MARRY THE BEAUTIFUL AND KIND
20 PRINT"▒BRUNHILDE ON TOMORROW MORN. BUT BEING
22 PRINT"YOUNG AND STUPID, YOU HAVE DECIDED TO
24 PRINT"SPEND YOUR LAST DAY DAY OF FREEDOM
26 PRINT"EXPLORING THE ENDLESS FOREST THAT
28 PRINT"SURROUNDS YOUR SHACK. YOU COULD STAY
30 PRINT"HOME AND WATCH TV BUT THEN YOU'D NEVER
32 PRINT"GET LOST IN THE FOREST AND FIND HIGH
34 PRINT"ADVENTURE AND LEARN TO BECOME A MAN
36 PRINT"AND WHAT THE MEANING OF LIFE IS.
38 PRINT"▒  NOW IN THE TRADITION OF ALL THESE
40 PRINT"TYPES OF GAMES, I'M SURE YOU'LL GO ALONG
42 PRINT"▒WITH THE OBVIOUS AND GET YOURSELF LOST.
44 PRINT"SO NOW THAT I'M BUSY, WHY DON'T YOU DO
46 PRINT"JUST THAT?? HAVE FUN ANYHOW...
48 PRINT"▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒▒  PRESS RETURN WHEN YOU ARE READY▒▒▒▒▒▒";
50 INPUT AN$
```

```
52 PRINT"▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓WILL 'O THE WISP▓▓":RETURN
54 DIM FL%(10),ITM%(10),ITM$(10),EX$(10)
56 FORI=1TO9:READITM%(I),ITM$(I),EX$(I):NEXT
58 DATA 30,BOTTLE,AN EMPTY BOTTLE LIES DISCARDED NEARBY
60 DATA 67,WATER,A SMALL POOL OF WATER COLLECTS HERE
62 DATA 0,BROOM,A SMELLY WITCHES BROOM FLOATS NEARBY
64 DATA 59,BALL,A MAGICAL CRYSTAL BALL GLISTENS HERE
66 DATA 51,CARPET,A FLYING CARPET IS ROLLED UP HERE,0,,RING
68 DATA 75,GUANO,A PILE OF BAT GUANO SLOWLY ROTS HERE
70 DATA 31,PEEL,AN OLD BANANA PEEL IS LYING IN THE DIRT
72 DATA 10,CAN,AN EMPTY BEER CAN RUSTS HERE
74 PSMZ=1
76 ITM$(6)="A GOLD WEDDING RING IS IN YOUR POCKET   FOR YOUR SWEET BRUN"
78 ITM$(6)=ITM$(6)+"HILDA FROM THE GREAT MAGICIAN RALPH"
80 TRUE=-1
82 FALSE=0
84 RETURN
86 :
88 GOSUB 104
90 IF PS=66 THEN GOSUB 410
92 IF EOG THEN RETURN
94 GOSUB 132
96 GOSUB 152
98 GOSUB 200
100 IF EOG THEN RETURN
102 GOTO 88
104 IF INT(RND(1)*100)+1<11 THEN PRINT:PRINT"A SMALL WISP IS FLOATING HERE...
106 MVE=MVE+1:IF MVE=1 THEN PRINT:GOTO 112
108 IF MVE=4 THEN MVE=0
110 RETURN
112 IFPS<11THENONPSGOTO606,622,634,642,652,662,676,690,704,716
114 IFPS<21THENONPS-YGOTO734,752,766,778,792,804,806,808,810,812
116 IFPS<31THENONPS-FGOTO814,816,828,840,850,858,864,876,884,896
118 IFPS<41THENONPS-GGOTO902,914,920,928,932,942,950,956,966,972
120 IFPS<51THENONPS-HGOTO978,982,984,986,988,990,992,994,1004,1012
122 IFPS<61THENONPS-RGOTO1018,1026,1034,1040,1048,1054,1060,1066,1072,1078
124 IFPS<71THENONPS-JGOTO1082,1090,1096,1102,1108,1116,1124,1132,1140,1148
126 IFPS<81THENONPS-KGOTO1154,1160,1168,1174,1180,1186,1192,1196,1202,1210
128 IFPS<91THENONPS-LGOTO1218,1224,1228,1234
130 RETURN
132 PRINT:FORI=1TO9:IFIT%(I)=PSTHENPRINT""EX$(I)
134 NEXT:PRINT"OBVIOUS EXITS:"; :IFN>0THENPRINT" N";
136 IFS>0THENPRINT" S";
138 IFE>0THENPRINT" E";
140 IFW>0THENPRINT" W";
142 IFNE>0THENPRINT" NE";
144 IFNW>0THENPRINT" NW";
146 IFSE>0THENPRINT" SE";
148 IFSW>0THENPRINT" SW";
150 RETURN
152 REM
154 PRINT:INPUT"▓▓▓▓▓▓▓";COM$
156 IFCOM$="▓"THENPRINT"▓▓▓ ▓";:GOTO 154
158 IF(COM$="AGAIN"ORCOM$="REPEAT")ANDVERB$<>""THENRETURN
160 IFCOM$="AGAIN"ORCOM$="REPEAT"ANDVERB$=""THEN1242
162 CP=0:GOSUB186
164 VERB$=BY$
166 GOSUB 186
168 NOUN$=BY$:IFVE$="NORTH"THENVE$="N"
170 IFVE$="SOUTH"THENVE$="S"
```

```
 172 IFVE$="EAST"THENVE$="E"
 174 IFVE$="WEST"THENVE$="W"
 176 IFVE$="NORTHEAST"THENVE$="NE"
 178 IFVE$="NORTHWEST"THENVE$="NW"
 180 IFVE$="SOUTHEAST"THENVE$="SE"
 182 IFVE$="SOUTHWEST"THENVE$="SW"
 184 RETURN
 186 REM
 188 IF CP>LEN(CO$)THEN BY$="":RETURN
 190 FOR SP=CP+1TOLEN(CO$):IF MID$(CO$,SP,1)<>" "THEN NEXT
 192 BY$=MID$(CO$,CP+1,SP-CP-1):CP=SP:IFBY$="THE"ORBY$="IT"ORBY$="A"THEN 188
 194 IF BY$="AN"ORBY$="THAT"ORBY$=""THEN 188
 196 IF BY$="JUMP"ORBY$="GO"ORBY$="TRAVEL"ORBY$="WALK"ORBY$="MOVE"THEN 188
 198 RETURN
 200 REM
 202 IF(VE$="N" OR VE$="E" OR VE$="S" OR VE$="W") AND IT%(8)=PS THEN 1262
 204 IF(VE$="NE" OR VE$="NW" OR VE$="SE" OR VE$="SW") AND IT%(8)=PS THEN 1262
 206 IF VE$="N" THEN 250
 208 IF VE$="E" THEN 254
 210 IF VE$="S" THEN 258
 212 IF VE$="W" THEN 262
 214 IF VE$="NE" THEN 266
 216 IF VE$="NW" THEN 270
 218 IF VE$="SE" THEN 274
 220 IF VE$="SW" THEN 278
 222 IF VE$="GET"ORVE$="TAKE"ORVE$="GRAB"ORVE$="CARRY"THEN328
 224 IF VE$="DROP"ORVE$="THROW"ORVE$="TOSS"ORVE$="LEAVE"THEN 348
 226 IF VE$="I" OR LEFT$(VE$,4)="INVE"THEN368
 228 IF VE$="BREAK" OR VE$="SMASH" OR VE$="DESTROY" THEN 382
 230 IF VE$="D"ORVE$="DOWN"THEN400
 232 IF VE$="IN" OR VE$="ENTER" THEN 532
 234 IF VE$="OUT" OR VE$="EXIT" THEN 544
 236 IF VE$="LOOK" OR VE$="SEE" OR VE$="VIEW" THEN MVE=0:RETURN
 238 IFVE$="SCORE"ORVE$="TOTAL"THENPRINT"YOU ARE STILL STUCK IN THE MAZES ";:GOT
01264
 240 IF VE$="HELP" THEN 566
 242 IFVE$="END"ORVE$="QUIT"ORVE$="STOP"ORVE$="DONE"THEN 586
 244 IFVE$="KILL"ORVE$="ATTACK"THENPRINT"YOU HAVE TO TELL ME HOW TO";:GOTO1268
 246 PRINT"WHAT???":RETURN
 248 REM
 250 IF N THEN PS=N:GOTO 286
 252 GOTO 280
 254 IF E THEN PS=E:GOTO 286
 256 GOTO 280
 258 IF S THEN PS=S:GOTO 286
 260 GOTO 280
 262 IF W THEN PS=W:GOTO 286
 264 GOTO 280
 266 IF NE THEN PS=NE:GOTO 286
 268 GOTO 280
 270 IF NW THEN PS=NW:GOTO 286
 272 GOTO 280
 274 IF SE THEN PS=SE:GOTO 286
 276 GOTO 280
 278 IF SW THEN PS=SW:GOTO 286
 280 PRINT"YOU CANNOT GO THAT WAY."
 282 IF PS=36THENPRINT"> BANG! < AS YOU HIT THE WALL, THE ROCKSWAKE";:GOTO1274
 284 RETURN
 286 REM
 288 MVE=0
 290 IF PS=23 AND NOT FLG%(1) THEN FLG%(1)=TR:PRINT GOTO1244
 292 IF PS=84 AND NOT FLG%(3) THEN PRINT:PRINT"YOU'VE FOUND PRUDENCE !!!"
 294 IF PS=16THENPRINT"A BLUE WILL 'O THE WISP BECKONS FROM THEEAST"
 296 IF PS=18THENPRINT"A BLUE WILL 'O THE WISP BECKONS FROM THEEAST"
 298 IF PS=19THENPRINT"A BLUE WILL 'O THE WISP BECKONS FROM THESOUTH"
 300 IF PS=20THENPRINT"A BLUE WILL 'O THE WISP BECKONS FROM THESOUTHWEST"
 302 IF PS=21THENPRINT"A BLUE WILL 'O THE WISP BECKONS FROM THESOUTHEAST"
 304 IF PS=22THENPRINT"A BLUE WILL 'O THE WISP BECKONS FROM    INSIDE THE CAVE"
 306 IF PS=23THENPRINT"A BLUE WILL 'O THE WISP DANCES OUTSIDE  THE CAVE'S ENTRAN
CE"
 308 IF(FLG%(2)<>1)ORFLG%(3)<>0THEN326
 310 IF PS=30THENPRINT"A GREEN WILL 'O THE WISP BECKONS FROM   THE NORTHEAST"
 312 IF PS=37THENPRINT"A GREEN WILL 'O THE WISP BECKONS FROM   THE NORTH"
 314 IF PS=42THENPRINT"A GREEN WILL 'O THE WISP BECKONS FROM   THE EAST"
 316 IF PS=43THENPRINT"A GREEN WILL 'O THE WISP BECKONS FROM   THE NORTHEAST"
 318 IF PS=44THENPRINT"A GREEN WILL 'O THE WISP BECKONS FROM   THE SOUTHEAST"
 320 IF PS=45THENPRINT"A GREEN WILL 'O THE WISP BECKONS FROM   THE SOUTHWEST"
 322 IF PS=46THENPRINT"A GREEN WILL 'O THE WISP BECKONS FROM   THE SOUTHWEST"
 324 IF PS=47THENPRINT"A GREEN WILL 'O THE WISP BECKONS FROM   THE SOUTH"
 326 RETURN
 328 REM
 330 FOR I=1TO9
 332 IF IT$(I)=NO$THEN336
 334 NEXT:PRINT"THAT IS BEYOND YOUR POWER.":RETURN
 336 IF IT%(I)=-1THENPRINT"YOU ARE ALREADY CARRYING IT!!":RETURN
 338 IFIT%(I)=0 THENPRINT"YOU CHEATER!! YOU HAVE TO WORK FOR THAT":RETURN
 340 IFIT%(I)<>PSTHENPRINT"I DO NOT SEE ANY "NO$" HERE.":RETURN
 342 IFI=2ANDIT%(1)<>-1THENPRINT"WHAT WILL YOU CARRY THE WATER IN?? ";:GOTO1250
 344 PRINT"OK! WHY NOT?":IT%(I)=-1
 346 RETURN
 348 REM
 350 FOR I=1 TO 9
 352 IF IT$(I)=NO$ THEN 356
 354 NEXT:PRINT"THAT IS BEYOND YOUR POWER.":RETURN
 356 IF IT%(I)<>-1THENPRINT"YOU ARE NOT CARRYING IT!!":RETURN
 358 IF I=1 AND IT%(2)=-1THENIT%(2)=PS:REM IF DROP BOTTLE, ALSO WATER
 360 PRINT"OK! WHY NOT?":IT%(I)=PS
 362 IF PS=84 AND IT%(2)=84 AND NOT FLG%(3) THEN 1252
 364 IF PS=84 AND IT%(2)=84 AND NOTFLG%(3)THEN FLG%(3)=TR:IT%(3)=PS:IT%(2)=-2
 366 RETURN
 368 REM
 370 PRINT
 372 PRINT:PRINT"YOUR INVENTORY IS AS FOLLOWS":PRINT:TMP=0
 374 FOR I=1 TO 9
 376 IF IT%(I)=-1 THEN PRINT""IT$(I):TMP=TMP+1
 378 NEXT:IF TMP=FALSE THEN PRINT" (NOTHING)"
 380 RETURN
 382 REM
 384 IF NO$="MIRROR" THEN 388
 386 PRINT"HOW CAN I BREAK THAT FOR YOU?":RETURN
 388 REM
 390 IF PS<>35THENPRINT"I DON'T SEE ANY MIRROR HERE. PERHAPS IF YOU KEEP ";
 392 IF PS<>35THENPRINT"LOOKING YOU'LL FIND ONE.":RETURN
 394 PRINT"THERE WAS SOMETHING BEHIND THAT MIRROR. A HUNGRY TROLL WAS BEHIND";
 396 PRINT" THAT MIRROR!  HE LEPT OUT AND MADE YOU HIS SUPPER.    TOO BAD ";
 398 PRINT"THOUGH, YOU JUST CAN'T TRUST A  HUNGRY TROLL.":EOG=TR:RETURN
 400 REM
 402 IF PS<>61THENPRINT"THERE IS NO WAY TO TRAVEL THROUGH THE   SOLID ROCK";
 404 IF PS<>61THENPRINT" STUPID!!!":RETURN
 406 PRINT"BOY ARE YOU DUMB. I TOLD YOU NOT TO JUMPAND NOW YOU'VE KILLED";
 408 PRINT" YOURSELF.":EOG=TR:RETURN
 410 REM
 412 IF FLG%(2) THEN 486
 414 PRINT:PRINT"RALPH LOOKS UP AT YOU SLOWLY... THE    ACCUMULATED WISDOM";
 416 PRINT" OF THE AGES PORING    FROM HIS SWEATY BROW. WELL?? HE CACKLES,";
 418 PRINT"WHAT IS IT THAT YOU WANT SO BADLY AS TO INTERRUPT ME FROM MY ";
 420 PRINT"STUDIES????▚▙▛▄▇▇▌";
 422 INPUTANS$:IFANS$="FREEDOM"ORANS$="HELP"ORANS$="OUT"ORANS$="HOME"THEN436
 424 PRINT:INPUT"WHAT??? HE SAYS... DO YOU WANT TO GET OUT OF HERE???▚▙▛▄▇▇▌";ANS
$
 426 IF LEFT$(ANS$,1)="Y" THEN 436
 428 PRINT:PRINT"WELL HE MUTTERS, SINCE I CAN'T SEEM TO UNDERSTAND YOU...";
 430 PRINT" I'LL JUST KILL YOU!!  AND WITH THAT HE WAVES HIS HANDS IN A"
 432 PRINT"MAGICAL MOTION AND YOU DISAPPEAR IN A  CLOUD OF BRIGHT ORANGE ";
 434 PRINT"DUST.":EOG=TR:RETURN
 436 IF ITM%(4)=-1OR ITM%(5)=-1THENPRINT:PRINT"I'D LIKE TO HELP YOU, BUT THAT IS
MY"
 438 IF ITM%(4)=-1OR ITM%(5)=-1THENPRINT"TREASURE THAT YOU HAVE THERE, AND I
 440 IF ITM%(4)=-1OR ITM%(5)=-1THENPRINT"DISLIKE A CLUMSY THIEF. SO SAY GOODBYE
 442 IF ITM%(4)=-1OR ITM%(5)=-1THENPRINT"QUICK CAUSE YOU'RE A GONER !!! AND WITH
 444 IF ITM%(4)=-1OR ITM%(5)=-1THENPRINT"THAT HE KILLS YOU !!!":EOG=TR:RETURN
 446 PRINT:PRINT"I'LL HELP YOU OUT... BUT FIRST I NEED A FAVOR. THERE IS A CERTA
IN ";
 448 PRINT"WITCH UP NORTH THAT I ONCE ANGERED AND SHE HAS        ENCHANTED MY ";
 450 PRINT"MAGIC STAFF AWAY FROM ME":PRINT
 452 PRINT"SHE TURNED IT INTO A BROOMSTICK AND I  WANT IT BACK! SO IF YOU";
 454 PRINT" CAN STEAL IT     FROM HER, I'LL SHOW YOU HOW TO GET OUT  OF HERE.";
 456 INPUT"DO YOU WANT TO TRY??▚▙▛▄▇▇▌";ANS$
 458 IFLEFT$(ANS$,1)<>"Y"THEN PRINT:PRINT"WELL I NEVER!!! I TRY TO HELP ";
 460 IFLEFT$(ANS$,1)<>"Y"THENPRINT"YOU AND   YOU CAN'T HELP ME!!! ";:GOSUB 4
 462 IFLEFT$(ANS$,1)<>"Y"THENPRINT"HELP YOU INTO A GRAVE !!AND WITH THAT HE ";
 464 IFLEFT$(ANS$,1)<>"Y"THENPRINT"PLUNGES A SWORD INTO   YOUR CHEST. YOU DIE."
 466 IFLEFT$(ANS$,1)<>"Y"THEN EOG=TR:RETURN
 468 PRINT:PRINT"GOOD!!! NOW AWAY YOU GO !!! BUT FIRST.. THE WAY INTO THE WITCH
S ";
 470 PRINT"LAND IS NOT    SIMPLE. ALL PATHS ARE CHARMED SO AS TO ONLY LEAD YOU "
;
 472 PRINT"AWAY FROM THE LAND."
 474 PRINT:PRINT"BUT IF YOU SIMPLY REVERSE THE TAUNTINGS OF THE GREEN WILL 'O TH
E ";
 476 PRINT"WISP, YOU'LL   GET THERE EASILY ENOUGH. OK... NOW FOR  THE BIG ";
 478 PRINT"FINISH !!!"
 480 PRINT:PRINT"THE MAGICIAN WAVES HIS HANDS, AND YOU   BLACK-OUT IN A FRENZY O
F ";
 482 PRINT"SENSATIONS. YOU AWAKE TO FIND..."
 484 PS=36:FLG%(2)=TR:MV=0:GOSUB 104
 486 RETURN
 488 REM
 490 PRINT:PRINT"WELL MUTTERS RALPH, I SEE YOU'RE BACK."
 492 IFITM%(4)=-1ORITM%(5)=-1THENPRINT"AND TRYING TO STEAL MY TREASURE!!! BOY
 494 IFITM%(4)=-1ORITM%(5)=-1THENPRINT"NOW YOU'VE GONE AND DONE IT... I'M MAD!!
 496 IFITM%(4)=-1ORITM%(5)=-1THENPRINT"AND A MAD WIZARD IS DANGEROUS!!! >POOF<
 498 IFITM%(4)=-1ORITM%(5)=-1THENPRINT"YOU ARE DEAD !!!":EOG=TR:RETURN
 500 IFITM%(3)<>-1THENPRINT"AND EMPTY HANDED !!! WELL I JUST CAN'T
 502 IFITM%(3)<>-1THENPRINT"ABIDE ANY FREELOADERS. BEGONE GNAT!!!
 504 IFITM%(3)<>-1THENPRINT"AND WITH THAT HE CLAPS HIS HANDS, YOU
 506 IFITM%(3)<>-1THENPRINT"TURN INTO A GNAT, AND GET EATEN BY THE
 508 IFITM%(3)<>-1THENPRINT"NEAREST SPIDER.":EOG=TR:RETURN
 510 IT%(6)=-1:IT%(3)=0:PRINT"AND WITH THE BROOM !! GOODY-GOODY HE
 512 PRINT"YELLS !! FOR FINDING MY STAFF I HEREBY
 514 PRINT"GRANT YOU YOUR FREEDOM AND A PRESENT !!
 516 PRINT"CHECK YOUR BELONGINGS LATER HE CACKLES"
 518 PRINT:PRINT">POOF!< YOU ARE STANDING UNDER A LARGE
 520 PRINT"BEAUTIFUL SPREADING TREE.":GOSUB368
```

```
522 PRINT"YOUR BELOVED BRUNHILDE IS RUNNING
524 PRINT"TOWARDS YOU THROUGH THE FIELD IN SLOW
526 PRINT"MOTION... LIFE IS BEAUTIFUL ONCE AGAIN
528 PRINT"AND ALL IS WELL. I HOPE YOU'VE ENJOYED  YOUR LITTLE EXCURSION."
530 EOG=TR:RETURN
532 REM
534 IF PS=22 AND NO$="CAVE" THEN VE$="SW":GOTO 206
536 IF PS=7 AND NO$="HOUSE" THEN VE$="E":GOTO 206
538 IF PS=48 AND NO$="CASTLE" THEN VE$="S":GOTO 206
540 IF PS=64 THEN VE$="N":GOTO 206
542 PRINT"ENTER WHAT ???":RETURN
544 REM
546 IFPS=23ANDNO$="CAVE"THENPRINT"THE BARS ARE QUITE SOLID AND YOU ARE BUT
548 IFPS=23ANDNO$="CAVE"THENPRINT"A POOR COUNTRY BOY. YOU CANNOT GO OUT":RETURN
550 IFPS=1ANDNO$="HOUSE"THENVE$="W":GOTO 262
552 IFPS=49THENVE$="N":GOTO 206
554 IF PS=56THENVE$"W":GOTO 206
556 IF PS=57 THEN VE$="E":GOTO 206
558 IF PS=65 THEN VE$="S":GOTO206
560 IF PS=50 THEN VE$="E":GOTO 206
562 IF PS=51 THEN VE$="W":GOTO 206
564 PRINT"EXIT WHAT ???":RETURN
566 REM
568 PRINT:INPUT"DO YOU REALLY WANT A LITTLE HELP▮▮▛▙██▌",ANS$
570 IF LEFT$(ANS$,1)<>"Y" THEN PRINT"WELL, SINCE NOT, BACK YOU GO.":RETURN
572 PRINT:PRINT"'GET' WILL LET YOU PICK UP AN OBJECT    'DROP' PUTS IT DOWN
574 PRINT"'INVENTORY' PRINTS YOUR SUPPLIES          'N' GOES NORTH, 'SW' GOES";
576 PRINT" SOUTHWEST ETC 'END' LEAVES THE GAME"
578 PRINT:PRINT"IF YOU ENCOUNTER A WITCH AND WISH TO    KILL HER (WHY NOT)";
580 PRINT" YOU HAVE TO FIGURE   OUT HOW. I WON'T TELL YOU, BUT IT WILL
582 PRINT"INVOLVE SOME OBJECTS AND ACTIONS THAT
584 PRINT"YOU WILL HAVE AVAILABLE. THAT'S ALL.":PRINT:RETURN
586 REM
588 PRINT:INPUT"DO YOU REALLY WISH TO QUIT NOW";ANS$
590 IF LEFT$(ANS$,1)<>"Y" THENPRINT"WELL IF YOU'VE CHANGED YOUR MIND, THEN
592 IF LEFT$(ANS$,1)<>"Y" THENPRINT"BACK YOU'LL GO!":RETURN
594 PRINT:PRINT"OK, BUT YOU DIDN'T DO SO WELL."
596 IF PS<23 THENPRINT"YOU DIDN'T EVEN FIND THE CAVES !!!":GOTO 604
598 IF NOT FLG%(2)THENPRINT"YOU DIDN'T MEET THE MAGICIAN !!!":GOTO 604
600 IF NOT FLG%(3)THENPRINT"YOU NEVER KILLED THE WITCH !!!":GOTO 604
602 PRINT"YOU DIDN'T GET THE BROOM TO THE MAGICIAN"
604 PRINT:PRINT"SIGH... WELL I SUPPOSE YOU TRIED...":EOG=TR:RETURN
606 REM
608 PRINT"YOU ARE IN A SMALL FARMHOUSE.  IT ISN'T
610 PRINT"MUCH BUT YOU CALL IT HOME. IN FACT IT
612 PRINT"ISN'T ANYTHING TO BE PROUD OF... IT IS
614 PRINT"REALLY PRETTY SHABBY... ACTUALLY IT IS
616 PRINT"DISGUSTING BUT YOU CALL IT HOME.  ONE   DOOR EXITS TO THE WEST.
618 N=0:E=0:S=0:W=7:NE=0:NW=0:SE=0:SW=0
620 RETURN
622 REM
624 PRINT"YOU ARE IN THE FOREST STILL. IT LOOKS
626 PRINT"LIKE YOU MAY BE LOST BUT YOU NEVER KNOW
628 PRINT"WITH THESE POOR FARM PEASANTS.
630 N=0:E=0:S=0:W=0:NE=4:NW=3:SE=0:SW=0
632 RETURN
634 REM
636 PRINT"YOU ARE IN A FOREST OF HUGE TREES. THE  FOREST IS FULL OF NUTS ..
638 N=0:E=0:S=0:W=0:NE=0:NW=0:SE=2:SW=5
640 RETURN
```

Let Commodore expand your horizons.

VIC 20
COLOUR COMPUTER
CARTRIDGE
SARGON II CHESS
GAMES
CHESS
commodore
COMPUTER

VIC 20 is the finest home computer that money can buy.

And the better you get to know it, the more confident, adventurous and ambitious you'll become.

You'll want to take advantage of the vast range of VIC software: a superb and constantly-growing selection of programs, embracing business systems, entertainment, education and many applications in the home.

Every program in the series has been designed by experts, and chosen for its quality and value for money.

VIC business software covers a wide range of applications, including spread-sheet analysis, stock control, information handling and word-processing.

A mind-blowing range of games including Scott Adams' world-famous 'Adventure' series.

Advanced space games, including the sophisticated 'Omega Race'.

Learn subjects as diverse as English Language, programming, and biology.

And 'home' software ranges from IQ tests to Robert Carrier menus.

In addition, there is a range of VIC software, like programmers' aids and graphics packages– to add to your understanding and enjoyment of computers and computing.

There's even a special 'VicSoft' Club for VIC 20 enthusiasts, with many advantages including special offers to club members.

MASTERMIND
HOME MASTERMIND
MONEY MANAGER
ROAD USER
KNOW YOUR PERSONALITY
KNOW YOUR IQ
ROBERT CARRIER
YOUR CHILD'S IQ
QUIZMASTER
VICFILE
VICWRITER
SIMPLICALC
STOCK CONTROL
OMEGA RACE
MISSION IMPOSSIBLE
VOODOO CASTLE
THE COUNT
ADVENTURE LAND
PIRATE COVE
STAR BATTLE
SUPER LANDER
RAT RACE
MOLE ATTACK
AVENGER
ALIEN
ROAD RACE
CHESS
MATHEMATICS 2
MATHS 2
MATHS 1
ENGLISH LANGUAGE
PHYSICS
CHEMISTRY
BIOLOGY
PROGRAMMER'S AID
SUPER EXPANDER
VIC 20 COLOUR COMPUTER
CARTRIDGE
SOFTWARE
commodore COMPUTER
Ivan Berg SOFTWARE

VIC software will expand your horizons. And your mind.

PRICES RANGE FROM £4.99 to £24.95 INC. VAT.

commodore
VIC 20

For more information, a catalogue of VIC software and details of your local retailers or dealers, please phone or complete the coupon and send to:
The Commodore Information Centre,
675 Ajax Avenue, Slough, Berkshire SL1 4BG.
Telephone: Slough (0753) 79292.

Name
(MR./MRS./MISS)
Address

Postcode

VCCC00383

```
642 REM
644 PRINT"IF YOU ARE NOT LOST YET THEN YOU KNOW
646 PRINT"THAT YOU ARE IN THE FOREST. (DOES THAT  MAKE ANY SENSE?)
648 N=0:E=0:S=0:W=0:NE=0:NW=0:SE=15:SW=2
650 RETURN
652 REM
654 PRINT"YOU ARE IN A FOREST OF HUGE TREES. THE
656 PRINT"FOREST IS FULL OF NUTS ..
658 N=0:S=0:E=0:W=0:NE=3:NW=0:SE=0:SW=6
660 RETURN
662 REM
664 PRINT"THE FOREST IS ALL AROUND YOU. YOU ARE IN";
666 PRINT"THE FOREST. IN THE FOREST YOU ARE. DO
668 PRINT"YOU NEED ANY MORE HELP? YOU ARE IN THE  HUGE FOREST WITH THE REST";
670 PRINT" OF THE NUTS.
672 N=0:E=0:S=8:W=0:NE=5:NW=0:SE=7:SW=0
674 RETURN
676 REM
678 PRINT"YOU ARE OUTSIDE YOUR DILAPIDATED RUNDOWN";
680 PRINT"DIRTY LITTLE FARMHOUSE. YOU CAN BREATHE
682 PRINT"FRESH AIR AGAIN. A WELL WORN PATH LEADS
684 PRINT"TO THE NORTH AND INTO THE FOREST.
686 N=5:E=1:S=0:W=0:NE=0:NW=0:SE=0:SW=0
688 RETURN
690 REM
692 PRINT"YOU ARE IN THE FOREST. GREAT MUSHROOMS
694 PRINT"GROW HERE. THEY LOOK GOOD TO EAT BUT
696 PRINT"COULD BE VERY WELL POISONOUS. I WOULD
698 PRINT"NOT TRY TO EAT THEM IF I WERE YOU.
700 N=6:E=0:S=0:W=0:NE=0:NW=0:SE=9:SW=0
702 RETURN
704 REM
706 PRINT"THE FOREST IS A LOVELY PLACE ISN'T IT?
708 PRINT"IT HAS TREES AND SQUIRRELS AND NUTS AND
710 PRINT"BUSHES AND YOU WHO ARE MOST LIKELY LOST!
712 N=0:E=0:S=0:W=0:NE=0:NW=0:SE=10:SW=0
714 RETURN
716 REM
718 PRINT"BOY YOU JUST KEEP WALKING DEEPER AND
720 PRINT"DEEPER INTO THE F0REST. WHY DID YOU HAVE";
722 PRINT"TO LEAVE THAT NICE LITTLE RUN DOWN
724 PRINT"SHANTY OF YOURS IN SEARCH OF ADVENTURE?
726 PRINT"IF YOU WANTED ADVENTURE THEN YOU ARE IN
728 PRINT"THE WRONG FANTASY.
730 N=0:E=0:S=0:W=0:NE=11:NW=9:SE=0:SW=0
732 RETURN
734 REM
736 PRINT"YOU ARE IN THE FOREST A LONG WAY
738 PRINT"FROM HOME. MONSTERS COULD BE ANYWHERE.
740 PRINT"THEY COULD BE... BEHIND YOU NOW!!! HA-HA";
742 PRINT"I'LL BET I SCARED YOU DIDN'T I??? WELL
744 PRINT"TO TELL THE TRUTH YOU ARE JUST IN THE
746 PRINT"FOREST WITH THE SQUIRRELS.
748 N=0:E=0:S=0:W=0:NE=0:NW=0:SE=12:SW=10
750 RETURN
752 REM
754 PRINT"THE FOREST IS GETTING DARKER AND YOU ARE";
756 PRINT"OUT WAY PAST MY BEDTIME. MAYBE YOU
758 PRINT"SHOULD TURN AROUND AND JUST GO HOME.
760 PRINT"THAT IS IF YOUR SHACK IS STILL STANDING.
762 N=0:E=0:S=0:W=0:NE=13:NW=11:SE=0:SW=0
764 RETURN
766 REM
```

```
768 PRINT"BOY IT IS REALLY DARK NOW... MONSTERS
770 PRINT"COULD BE ANYWHERE... WHY NOT GO HOME TO
772 PRINT"YOUR MOTHER?
774 N=14:E=0:S=0:W=9:NE=17:NW=0:SE=0:SW=0
776 RETURN
778 REM
780 PRINT"AHA! YOU ARE IN A CLEARING AND CAN SEE
782 PRINT"A TRAIL YOU ARE FAMILIAR WITH LEADING TO";
784 PRINT"THE SOUTH-WEST. OF COURSE THERE ARE
786 PRINT"OTHER TRAILS BUT THIS SEEMS THE SMARTESTMOVE AT THIS TIME.
788 N=15:E=0:S=13:W=0:NE=0:NW=0:SE=0:SW=7
790 RETURN
792 PRINT"WELL FOR THE HOPELESSLY LOST... YOU ARE
794 PRINT"IN THE LARGE DARK MEAN SCARY NASTY OLD
796 PRINT"FOREST AND MOST LIKELY YOU'LL DIE HERE
798 PRINT"AND GET EATEN BY THE ROTTEN SQUIRRELS.
800 N=0:E=0:S=14:W=0:NE=0:NW=4:SE=0:SW=0
802 RETURN
804 GOSUB 1270:N=0:E=18:S=17:W=0:NE=0:NW=15:SE=0:SW=0:RETURN
806 GOSUB 1270:N=16:E=0:S=0:W=0:NE=0:NW=0:SE=0:SW=13:RETURN
808 GOSUB 1270:N=15:E=19:S=17:W=16:NE=15:NW=15:SE=17:SW=17:RETURN
810 GOSUB 1270:N=15:E=15:S=20:W=18:NE=15:NW=15:SE=15:SW=17:RETURN
812 GOSUB 1270:N=19:E=15:S=15:W=17:NE=15:NW=17:SE=15:SW=21:RETURN
814 GOSUB 1270:N=17:E=15:S=0:W=17:NE=20:NW=17:SE=22:SW=0:RETURN
816 PRINT"YOU'RE IN FRONT OF A LARGE CAVE ENTRANCE";
818 PRINT"WHAT APPEARS TO BE A HUGE POT OF GOLD IS";
820 PRINT"SITTING IN THE CAVE. YOU'LL BE RICH! YOU";
822 PRINT"GET YOUR MOTHER HER OPERATION! YOU
824 PRINT"CAN BUY SHOES FOR YOUR SISTER! BOY ARE  YOU LUCKY!!!
826 N=15:E=15:S=15:W=17:NE=15:NW=21:SE=15:SW=23:RETURN
828 PRINT"YOU ARE IN THE CAVE. THE EXIT IS BARRED
830 PRINT"BY HUGE STEEL BARS AND TRY AS YOU LIKE
832 PRINT"YOU CANNOT GET THEM OPEN. NOW YOU'LL
834 PRINT"MISS YOUR WEDDING AND BRUNHILDE IS GOING";
836 PRINT"CRY VERY LOUDLY WHEN SHE FINDS OUT.
838 N=0:E=0:S=24:W=0:NE=0:NW=0:SE=0:SW=0:RETURN
840 PRINT"YOU ARE IN THE CAVES PROPER NOW. THERE
842 PRINT"SEEMS TO BE MANY DIFFERENT TUNNELS ABOUT";
844 PRINT"HERE AND ONE LARGE ONE RUNS TO THE EAST.";
846 PRINT"OFCOURSE YOU DON'T HAVE TO LISTEN TO ME YOU COULD ALWAYS TRY WEST.
848 N=23:E=28:S=25:W=26:NE=0:NW=0:SE=0:SW=0:RETURN
850 PRINT"WELL LETS SEE... THERE IS A TUNNEL HERE
852 PRINT"THAT RUNS EAST/WEST AND THERE IS A SMALL";
854 PRINT"FISSURE BARELY MANAGEABLE THAT GOES TO  THE NORTH-EAST.
856 N=0:E=28:S=0:W=26:NE=24:NW=0:SE=0:SW=0:RETURN
858 PRINT"THE TUNNEL BRANCHES OFF HERE INTO TWO
860 PRINT"PATHS OTHER THAN THE ONE YOU JUST CAME  THROUGH. CONFUSING ISN'T IT??
?
862 N=24:E=25:S=27:W=0:NE=0:NW=0:SE=0:SW=0:RETURN
864 PRINT"THE TUNNEL HERE TURNS SLIGHTLY OFF
866 PRINT"COURSE. OH BY THE WAY, IF YOU WERE WOND-";
868 PRINT"ERING ABOUT HOW YOU COULD SEE IF YOU ARE";
870 PRINT"THIRTY OR FORTY FEET UNDERGROUND... THE
872 PRINT"AIR IS FILLED WITH MAGIC AND IT GLOWS   ENOUGH FOR YOU TO SEE BY.
874 N=0:E=26:S=30:W=0:NE=0:NW=0:SE=0:SW=0:RETURN
876 PRINT"YOU ARE AT A SMALL INTERSECTION OF ABOUT";
878 PRINT"FOUR PASSAGES. WELL EXACTLY FOUR PASS-
880 PRINT"AGES. I'M NOT GOING TO TELL YOU WHICH   WAY THEY GO !!
882 N=24:E=0:S=31:W=25:NE=0:NW=0:SE=0:SW=29:RETURN
884 PRINT"YOU ARE AT THE INTERSECTION OF TWO SMALL";
886 PRINT"PASSAGES. ONE LEADS NORTH-WEST AND THE
888 PRINT"OTHER LEAVES TO THE SOUTH. ON THE WALL
890 PRINT"IS SCRAWLED... 'DEATH TO THOSE WHO TAKE
892 PRINT"THE SOUTH PASSAGE'.
```

```
 894 N=0:E=0:S=38:W=0:NE=0:NW=26:SE=0:SW=0:RETURN
 896 PRINT"NOT 'MANY' BUT QUITE A FEW PASSAGES
 898 PRINT"LEAVE THIS ROOM. CAN YOU FIND THEM??
 900 N=27:E=0:S=0:W=0:NE=0:NW=0:SE=36:SW=37:RETURN
 902 PRINT"THE ROOM HERE IS EXTREMELY DARK. I CAN
 904 PRINT"NOT TELL YOU ANYTHING EXCEPT THAT A
 906 PRINT"LARGE ROCK HERE IS REPELLING THE MAGIC
 908 PRINT"THAT GIVES YOU LIGHT. YOU HAVE ALSO BEEN";
 910 PRINT"BUMPING INTO WALLS NOW FOR ABOUT FIFTEENMINUTES.
 912 N=0:E=0:S=33:W=28:NE=0:NW=0:SE=32:SW=0:RETURN
 914 PRINT"AHA! YOU GOT YOURSELF OUT OF THAT LAST
 916 PRINT"ROOM! GOOD! NOW YOU CAN FOLLOW THE NEXT TUNNEL AS IT LEADS YOU ";
 918 PRINT"SOUTHWARD.":N=0:E=0:S=34:W=0:NE=0:NW=0:SE=0:SW=0:RETURN
 920 PRINT"THE ROOM HERE IS FILLED WITH DUST. IT
 922 PRINT"CLOGS YOUR EYES AND MAKES IT DIFFICULT
 924 PRINT"TO SEE. FOLLOW ME TO THE NORTH OR TO THESOUTH-WEST AND WE'LL GET OUT.
 926 N=31:E=0:S=0:W=0:NE=0:NW=0:SE=0:SW=35:RETURN
 928 PRINT"A QUICK BEND IN THE PATH AND YOU NOW   HAVE TO TRAVEL A DIFFERENT WA
Y.
 930 N=32:E=0:S=0:W=39:NE=0:NW=0:SE=0:SW=0:RETURN
 932 PRINT"THESE TUNNELS SEEM ENDLESS DON'T THEY?
 934 PRINT"WELL YOU MIGHT BE SURPRISED AT WHAT YOU
 936 PRINT"CAN FIND IN HERE. MAYBE IF YOU BREAK THE";
 938 PRINT"BIG MIRROR ON THE WEST WALL YOU'D FIND  SOMETHING OF INTEREST BEHIND
IT.
 940 N=0:E=0:S=0:W=0:NE=33:NW=0:SE=0:SW=38:RETURN
 942 PRINT"YOU HAVE ENTERED A SMALL CHAMBER OF
 944 PRINT"SLEEPING ROCKS. THEY MUST BE SLEEPING
 946 PRINT"SINCE THEY ARE NOT MOVING. TIP-TOE      QUIETLY OUT AND YOU WON'T WAK
E";
 948 PRINT" THEM.":N=0:E=0:S=41:W=0:NE=29:NW=30:SE=0:SW=0:RETURN
 950 PRINT"YOU ARE IN A SMALL EVEN WALLED CAVE ROOM";
 952 PRINT"A FEELING OF DIZZINESS CONFUSES YOUR    TRAVELS."
 954 N=36:E=36:S=42:W=0:NE=36:NW=30:SE=0:SW=0:RETURN
 956 PRINT"WELL... THE MESSAGE IN THE LAST ROOM
 958 PRINT"MUST HAVE BEEN MISTAKEN... SINCE YOU ARE";
 960 PRINT"STILL ALIVE. WELL ONE CAN'T BELIEVE ANY
 962 PRINT"GRAFITTI THEY READ ON WALLS CAN THEY?
 964 N=0:E=0:S=0:W=0:NE=35:NW=0:SE=0:SW=41:RETURN
 966 PRINT"THREE PASSAGES LEAVE HERE. ONE TO THE
 968 PRINT"NORTH... ONE TO THE WEST... AND ONE TO  THE SOUTH. WHICH WAY WILL";
 970 PRINT" YOU TAKE?":N=34:E=0:S=40:W=33:NE=0:NW=0:SE=0:SW=0:RETURN
 972 PRINT"FOUR PATHS LEAVE HERE. LOUD MAJESTIC    SINGING SEEMS TO BE COMI";
 974 PRINT"NG FROM NEARBY. COULD THIS BE A SIGN? COULD IT LEAD OUT OF HERE?";
 976 PRINT" COULD YOU BE GOING HOME???":N=35:E=39:S=0:W=41:NE=0:NW=0:SE=0:SW=48:
RETURN
 978 PRINT"THE PASSAGE TURNS A CORNER. THAT'S ALL  THIS ROOM RATES AS A DISCRIPT
ION.
 980 N=36:E=0:S=0:W=0:NE=38:NW=0:SE=0:SW=0:RETURN
 982 GOSUB 1258:N=37:E=41:S=41:W=43:NE=41:NW=0:SE=41:SW=44:RETURN
 984 GOSUB 1258:N=42:E=42:S=41:W=0:NE=0:NW=0:SE=41:SW=44:RETURN
 986 GOSUB 1258:N=43:E=43:S=0:W=0:NE=43:NW=45:SE=0:SW=0:RETURN
 988 GOSUB 1258:N=44:E=43:S=44:W=44:NE=46:NW=44:SE=44:SW=0:RETURN
 990 GOSUB 1258:N=45:E=43:S=43:W=44:NE=47:NW=44:SE=43:SW=45:RETURN
 992 GOSUB 1258:N=67:E=43:S=43:W=46:NE=43:NW=46:SE=43:SW=46:RETURN
 994 PRINT"YOU ARE AT THE ENTRANCE TO A LARGE CLEAN";
 996 PRINT"CASTLE. IT IS THE HOME OF THE ALL POWER-";
 998 PRINT"FUL ALL KNOWING ALL KIND ALL DRUNK
 1000 PRINT"MAGICIAN RALPH. HE ALONE HAS THE POWER  TO GET YOU HOME TO SWEET BRU
N";
 1002 PRINT"HILDE.":N=40:E=0:S=49:W=0:NE=0:NW=0:SE=0:SW=0:RETURN
 1004 PRINT"YOU ARE AT THE NORTH END OF THE GREAT   HALL. FINE PICTURES AND ";
 1006 PRINT"OIL PAINTINGS   ARE HUNG FROM THE WALLS. THIS MAGICIAN  SEEMS TO";
```

```
1008 PRINT" HAVE DONE WELL FOR HIMSELF.":N=48:E=0:S=50:W=0:NE=0:NW=0:SE=0:SW=0
1010 RETURN
1012 PRINT"YOU ARE IN THE MIDDLE OF THE HALL. A    DOOR TO YOUR RIGHT LEADS ";
1014 PRINT"INTO THE BLUE  ROOM AND ONE TO YOUR LEFT TO THE GREEN  ROOM.":N=49
1016 E=51:S=53:W=52:NE=0:NW=0:SE=0:SW=0:RETURN
1018 PRINT"YOU ARE IN THE BLUE ROOM. A GREAT SENSE OF DEEPRESSION FLOWS LIKE";
1020 PRINT" WAVES THROUGH YOU. YOU LONG FOR HOME AND YOUR SWEET   BRUNHILDE";
1022 PRINT". HOW YOU WISH YOU WERE THERE.":N=0:E=0:S=0:W=50:NE=0:NW=0:SE=0
1024 SW=0:RETURN
1026 PRINT"YOU ARE IN THE GREEN ROOM. YOU ARE SUDD-ENLY VERY JEALOUS OF RAL";
1028 PRINT"PH AND HIS FINE CASTLE. HOW COME HE RATES ALL THIS STUFFAND YOU ";
1030 PRINT"LIVE IN A HOLE IN THE GROUND?!?":N=0:E=50:S=0:W=0:NE=0:NW=0:SE=0
1032 SW=0:RETURN
1034 PRINT"YOU ARE NOW AT THE SOUTH END OF THE     GREAT HALL. HALLWAYS LEA";
1036 PRINT"VE TO THE NORTH AND TO THE EAST AN TO THE WEST.":N=50:E=54:S=0
1038 W=61:NE=0:NW=0:SE=0:SW=0:RETURN
1040 PRINT"YOU ARE IN THE MIDDLE OF THE EAST HALL. A RAT SCURRIES PAST YOU ";
1042 PRINT"AND TAKES A NIP AT YOUR LEG. IN AN INSTANT HE IS GONE   WITH A ";
1044 PRINT"SNEER AND A TWITCH OF HIS TAIL.":N=0:E=55:S=0:W=53:NE=0:NW=0:SE=0
1046 SW=0:RETURN
1048 PRINT"YOU ARE AT THE END OF THE EAST HALL. THEONLY NEW PASSAGE IS A SM";
1050 PRINT"ALL SERVANTS    EXIT TO THE SOUTH-EAST.":N=0:E=0:S=0:W=54:NE=0:NW=0
1052 SE=56:SW=0:RETURN
1054 PRINT"YOU ARE IN THE SERVANT'S AREA. SINCE    RALPHS LAST SERVANT DIED";
1056 PRINT" NINE-HUNDRED   YEARS AGO THE PLACE IS A MESS AND ALSO  SMELLS P";
1058 PRINT"RETTY BAD.":N=0:E=0:S=0:W=57:NE=55:NW=0:SE=0:SW=0:RETURN
1060 PRINT"YOU ARE OUTSIDE THE SERVANTS QUARTERS.  A DISTRESSING SMELL COME";
1062 PRINT"S FROM THE EAST.ITS BEST TO GO BACK TO THE WEST FOR YOURNOSES SAKE.
1064 N=0:E=56:S=0:W=58:NE=0:NW=0:SE=0:SW=0:RETURN
1066 PRINT"YOU ARE IN THE MIDDLE OF THE SOUTH HALL.AN EERIE LIGHT COMES FROM";
1068 PRINT" THE WEST AND  GREAT MUSIC FILLS THE AIR.":N=0:E=57:S=0:W=59:NE=0
1070 NW=0:SE=0:SW=0:RETURN
1072 PRINT"YOU ARE AT THE END OF THE SOUTH HALL.   TWO SMALL PASSAGES LEAVE ";
1074 PRINT"HERE. ONE TO   THE NORTH-WEST AND ONE TO THE SOUTH-WEST":N=0:E=58
1076 S=0:W=0:NE=0:NW=60:SE=0:SW=62:RETURN
1078 PRINT"YOU ARE AT THE END OF THE WEST HALL. A  SMALL PASSAGE LEADS TO TH";
1080 PRINT"E SOUTH-WEST.":N=0:E=61:S=0:W=0:NE=0:NW=0:SE=0:SW=59:RETURN
1082 PRINT"YOU ARE IN THE MIDDLE OF THE WEST HALL. A LARGE HOLE IN THE FLOO";
1084 PRINT"R REVEALS A HUGEDROP TO THE GROUND HUNDREDS OF FEET
1086 PRINT"BELOW. BETTER NOT GO DOWN...":N=0:E=53:S=0:W=60:NE=0:NW=0:SE=0
1088 SW=0:RETURN
1090 PRINT"YOU ARE IN A WINDING PASSAGE. AS YOUR   TRAVEL PROGRESSES THE EER";
1092 PRINT"IE MUSIC GETS  LOUDER AND YOU GET COLDER BUT THIS COULDBE THE WAY";
1094 PRINT" OUT!!!":N=0:E=59:S=0:W=0:NE=0:NW=63:SE=0:SW=0:RETURN
1096 PRINT"YOU ARE IN A CONNECTING HALLWAY WITH    SOME LOUD ALBEIT EERIE MU";
1098 PRINT"SIC EMANATING  FROM THE SOUTH-WEST.":N=0:E=0:S=0:W=0:NE=62:NW=0
1100 SE=0:SW=64:RETURN
1102 PRINT"YOU ARE IN A SMALL ANTE-CHAMBER. A LARGEWELL USED PASSAGE LEADS ";
1104 PRINT"TO THE NORTH ANDA SMALLER PASSAGE TO THE WEST. EERIE    MUSIC COM";
1106 PRINT"ES FROM THE NORTH.":N=65:E=0:S=0:W=66:NE=0:NW=0:SE=63:SW=0:RETURN
1108 PRINT"YOU OPEN THE DOOR AND ENTER INTO.....    RALPHS BATHROOM. A RADIO ";
1110 PRINT"TUNED TO ONE OFTHE MORE POPULAR ROCK STATIONS IS BLAST-ING FORTH ";
1112 PRINT"PUNK ROCK MUSIC. THE EFFECT ITHAS ON THE CASTLES WALLS IS EERIE ";
1114 PRINT"INDEED":N=0:E=0:S=64:W=0:NE=0:NW=0:SE=0:SW=0:RETURN
1116 PRINT"YOU ARE IN THE LIBRARY WHERE THE GOOD   MAGICIAN RALPH IS POURING";
1118 PRINT" OVER AN OLD   AND ANCIENT TOME. THE WORD YOBYALP SHOWSTHROUGH TH";
1120 PRINT"E COVER FROM THE LIGHT BEHIND.RALPH IS DEEPLY ABSORBED IN THE BOOK.
1122 N=0:E=64:S=0:W=0:NE=0:NW=0:SE=0:SW=0:RETURN
1124 PRINT"YOU ARE AT THE EDGE OF THE EVIL WITCHES LAND. THE EVIL PRUDENCE ";
1126 PRINT"DOES NOT SEEM TOBE ANYWHERE AROUND. THAT IS GOOD FOR YOUSINCE SH";
1128 PRINT"E COULD TURN YOU INTO AN UGLIER TOAD THAN YOU ALREADY ARE.":N=68
1130 E=47:S=73:W=0:NE=0:NW=0:SE=0:SW=0:RETURN
1132 PRINT"WALKING NORTH YOU WILL FIND A TWISTING  OLD TRAIL. TO THE WEST ";
```

```
 1134 PRINT"LIES CONFUSION.  SOUTH IS THE WAY TO GO FOR A FAST EXIT  FROM THIS";
 1136 PRINT" LAND. GO THERE IF YOU VALUE   YOUR LIFE.":N=69:E=0:S=67:W=70:NE=0
 1138 NW=0:SE=0:SW=0:RETURN
 1140 PRINT"THERE IS A TINY LITTLE HIDDEN TWISTING  SECRET OLD OVERGROWN DIRTY";
 1142 PRINT" SNEAKY TRAIL THAT LEADS WEST FROM HERE. SOUTH IS MUCHNICER BUT ";
 1144 PRINT"NOT A LOT OF FUN. A ROCK HERE SAYS 'THIS WAY TO THE TLHTSOODST'";
 1146 PRINT" AND ITPOINTS WEST":N=0:E=0:S=68:W=72:NE=0:NW=0:SE=0:SW=0:RETURN
 1148 PRINT"YOU ARE IN A SMALL CLEARING, A PAPER   LIES NEARBY. IT READS ";
 1150 PRINT"'CONFUSION SAYS-  EXPLORER WHO GETS OUT... IS VERY LUCKY  INDEED...'
"
 1152 N=70:E=70:S=70:W=70:NE=70:NW=70:SE=70:SW=74:RETURN
 1154 PRINT"YOU ARE IN THE MIDDLE OF A LONG BORING  NORTH-SOUTH PATHWAY.";
 1156 PRINT" YOUR HEAD IS        SLIGHTLY ACHING.":N=72:E=0:S=70:W=0:NE=0:NW=0
 1158 SE=0:SW=0:RETURN
 1160 PRINT"YOU ARE IN THE SNEAKY CLEARING. THERE  ARE THREE EXITS FROM HERE.";
 1162 PRINT" ONE THAT GOESTO THE SOUTH... ONE TO THE SOUTH-WEST...AND A DIRTY";
 1164 PRINT" SNEAKY.....LITTLE TRAIL TO  THE NORTH.":N=69:E=0:S=71:W=0:NE=0:NW=0
 1166 SE=0:SW=76:RETURN
 1168 PRINT"A SMALL CLEARING AT THE SOUTHERN EDGE OFTHE EVIL PRUDENCES LAND ";
 1170 PRINT"GIVES YOU ROOM  TO REST AND RELAX. TWO PATHS LEAD AWAYFROM HERE.
 1172 N=70:E=0:S=0:W=0:NE=0:NW=77:SE=0:SW=0:RETURN
 1174 PRINT"AN INTERSECTION OF THREE PATHS IS HERE. YOUR HEAD ACHES SLIGHTLY ";
 1176 PRINT"AS YOU APPROACHTHE AREA. YOU CAN LEAVE WITH MY BLESSINGIF YOU FIND";
 1178 PRINT" THE WAY OUT.":N=75:E=0:S=78:W=0:NE=70:NW=0:SE=0:SW=0:RETURN
 1180 PRINT"THE PATHS ORIENTATION BECOMES SUBTLY    ALTERED AS ROUND YON CORNER.
 ";
 1182 PRINT"WATCH  OUT FOR THE BAT GUANO TO YOUR LEFT.":N=0:E=0:S=74:W=0:NE=0
 1184 NW=79:SE=0:SW=0:RETURN
 1186 PRINT"THE MIDPOINT FOR A LONG SLOPING CORRIDORIS WHERE YOU ARE. NOT MUCH";
 1188 PRINT" SPECIAL ABOUTTHIS PLACE EXCEPT THE SMELL OF BAT GUANO":N=0:E=0:S=0:
W=0
 1190 NE=72:NW=0:SE=0:SW=79:RETURN
 1192 PRINT"YOU ARE AT THE MIDPOINT OF A LONG LONG  SLOPING CORRIDOR LEADING ";
 1194 PRINT"SLIGHTLY SOUTH.":N=0:E=0:S=0:W=0:NE=74:NW=81:SE=73:SW=0:RETURN
 1196 PRINT"THE PATH HERE IS LITTERED WITH THE FRESHREMAINS OF BATS AND TOADS.";
 1198 PRINT" THEIR BODIES ARE STILL DECAYING IN THE DIRT.":N=0:E=0:S=74:W=82:NE=
0
 1200 NW=0:SE=0:SW=0:RETURN
 1202 PRINT"YOU ARE AT THE INTERSECTION OF THREE   TRAILS. ONE TO THE WEST ";
 1204 PRINT"AND ONE TO THE  NORTH/EAST  AND ONE TO THE SOUTH/EAST.  WHEN YOUR ";
 1206 PRINT"COMPASS WORKS... IT SURE IS A HANDY THING TO HAVE.":N=0:E=0:S=0:W=83
 1208 NE=76:NW=0:SE=75:SW=0:RETURN
 1210 PRINT"YOU ARE OVERCOME BY THE FEELING OF     NAUSEA. AS YOU TRY TO ALIGN
";
 1212 PRINT"YOURSELF ON YOUR COMPASS YOU ROCK AND REEL BACK AND FORTH AND FIND";
 1214 PRINT" IT DIFFICULT TO WALK IN ASTRAIGHT LINE. WHAT COULD BE CAUSING
 1216 PRINT"THIS TO HAPPEN???":N=71:E=72:S=79:W=77:NE=69:NW=84:SE=76:SW=82:RETUR
N
 1218 PRINT"AT THE SOUTHWEST EDGE OF THE WITCHES    LAND THE TUNNEL TURNS SLIGHT
LY.";
 1220 PRINT" EITHER  THAT OR WALK INTO THE HUGE ROCK THAT IS IN ITS WAY.":N=82:E
=0
 1222 S=0:W=0:NE=0:NW=0:SE=77:SW=0:RETURN
 1224 PRINT"OOPS!!! A SHARP TURN FORCES YOU TO GO   EITHER SOUTH OR EAST DEPENDI
NG ";
 1226 PRINT"ON WHICH WAY YOU CAME FROM.":N=0:E=78:S=81:W=0:NE=0:NW=0:SE=0:SW=0:R
ETURN
 1228 PRINT"A ROOM HERE HAS AN EASTERN EXIT AND ALSOA NORTHERN ONE. FROM THE NOR
TH ";
 1230 PRINT"COMES A  FUNNY FEELING OF DIZZINESS.":N=80:E=79:S=0:W=0:NE=0:NW=0:SE
=0
```

```
 1232 SW=0:RETURN
 1234 PRINT"YOU ARE AT THE EVIL WITCH PRUDENCES OLDEBLACKSMITHE SHOPPE. HERE WIT
H ";
 1236 PRINT"HER BLASTEFURNACEE IS WHERE SHE FORGES HER HORSES SHOES FOR HER HUNT
IN";
 1238 PRINT"G RAIDS. THE HEAT  FROM THE FURNACE BURNS TO YOUR SOUL.":N=0:E=0:S
=0
 1240 W=0:NE=80:NW=0:SE=0:SW=0:RETURN
 1242 PRINT"I CAN'T LET YOU DO IT AGAIN, YOU HAVEN'TDONE ANYTHING YET!!!":GOTO15
4
 1244 PRINT"*** BANG *** !!! AS YOU ENTER HERE, THE GOLD DISAPPEARS IN A";
 1246 PRINT"FLASH, AND A HUGE  SET OF STEEL BARS DROPS INTO PLACE     LOCKING";
 1248 PRINT" YOU INTO THE CAVES.":PRINT:GOTO 292
 1250 PRINT"YOUR HANDS?? YOU HAVE TO FIND A CONTAINER.":RETURN
 1252 PRINT"AUURRRGGGHHHHH!!! SCREAMS THE WITCH !!! IN HER HASTE,  THE WITCH";
 1254 PRINT" FALLS INTO THE BLAST FURNACE!! HELP !! I'M SMELTING... ";
 1256 PRINT"SMELTING... IS THE LAST SHE BREATHS.":GOTO364
 1258 PRINT"THE TUNNELS IN HERE ARE VERY CONFUSING. YOU WILL NEVER GET OUT ALIVE
."
 1260 RETURN
 1262 PRINT"YOU SLIPPED AND FELL ON THE BANANA PEEL,WHY NOT TRY AGAIN?":RETURN
 1264 PRINT"AREN'T YOU ??? WELL THAT'S ALL YOU NEED TO KNOWABOUT HOW YOU ARE";
 1266 PRINT" DOING.":RETURN
 1268 PRINT" KILL              THE "NO$:RETURN
 1270 PRINT"THE FOREST IS VERY DARK. MOST TRAILS
 1272 PRINT"SEEM ALIKE AND YOU CANNOT GET YOUR          BEARINGS IN HERE.":RETURN
 1274 PRINT" UP AND NOTICE YOU IN THEIR REALM.  THEY STONED YOU TO DEATH."
 1276 EOG=TRUE:RETURN
READY.
```

soft toys
VIC Attack!
An arcadegame with Hi-Res, Machine Code and Joystick option for the unexpanded VIC 20
with Breakout
£3
soft toys 1
7 Games for VIC Including -
THE DEEP, CODE MAKER, PONTOON for 3.5k VIC
KILLER PARK, MUSIK for 6.5k VIC
£5
soft toys 2
6 Games for 3k expanded VIC - Lunar Lander
Casino
Simon Says...
Maths Maze
3-D Maze
Hangman
£7
soft toys
The Lair
adventure for 16k VIC20
£6
soft toys
Star Warp II
A Fast-Action Realtime Space Adventure for 16k VIC 20
BLAM!
ZAP!
£7
soft toys
Game Graphics & Graphics Editor
A full-featured utility for Hi-Resolution customised graphics in your games.
For the unexpanded VIC and VIC with 3k expansion.
£7

* SUPERB programs – AMAZING value!! *

Write or 'phone for your catalogue now.

All prices include P&P 1st class. Send cheque/PO to:

soft toys 14, Lockharton Avenue, Edinburgh EH14 1AZ. Tel: 031 443 2005

DEALER ENQUIRIES WELCOME.

ANNOUNCING

THE COMMODORE 64 HI-RES SOUNDBOX

THIS SIMPLE TO USE ADD-ON UNIT FOR YOUR COMMODORE 64 AND VIC 20, TAKES YOUR COMPUTER INTO THE REALMS OF HIGH FIDELITY SOUND REPRODUCTION AND MUSICAL COMPOSITION.

YOU WILL BE ASTOUNDED BY THE CLARITY AND BRILLIANCE OF SOUND PRODUCED BY ITS INTEGRAL AMPLIFIER AND POWERFUL SPEAKER.

Available from:

MICROTRADING LTD.
641 Bromford Lane,
Birmingham B8.
Tel. 021-784 0077

FOR ONLY £49.45 INCLUDING VAT

DEALER ENQUIRIES WELCOME
See us on Stand 17/18

Breakout and a VIC-20 one-armed bandit

This month we have two programs for the VIC-20.

The first game is Breakout, which will run on an unexpanded VIC and makes use of colour and sound. At the end of the listing there is some data that is poked into the machine. The main idea of the routine, called by sys 7424, is to read in from the keyboard, change position of the bat and plot the bat up. I know that you can do that in Basic, but it would be slower. If you want your bat to look different, try changing the values at the end of the data statements of 120, 120, 120 as they are the poke values of the bat (they must all be the same value). Also the same value will have to be changed in line 400.

> Be prepared. If you bet 12 pence and three PBE symbols appear, you will receive 1200 pence back, and that takes a long-time.

For all those fruit machine addicts, the next one (pages 22, 23) is for you. This is a one-armed bandit in which you insert as much money as you wish up to 12 pence. Be prepared; if you bet 12 pence and three PBE symbols appear, you will receive 1200 pence back and that takes a long time. When typing it in, be careful with the graphics symbols.

Breakout

```
100 REM (C) PET BENELUX
110 REM     EXCHANGE
120 REM     NETHERLANDS
130 GOTO0770
140 HA=36878:S1=36876:S2=36877
150 POKEHA,15
160 GOSUB670
170 POKE36879,12:P=8:BA=5
180 PRINT"▓▓▓ ______________________________ ";
190 FORI=1TO21:PRINT"▓▓ ▓▓                              ▓▓ ▓▓▓▓▓▓ ":NEXT
200 PRINT"▓▓ ▓▓                              ▓▓ ▓▓▓▓▓▓ ▓"
210 PRINT"▓▓▓▓":A$="▓┳┳┳┳┳┳┳┳┳┳┳┳┳┓"
220 PRINT"▓▓▓"A$:PRINT"▓▓"A$
230 PRINT"▓▓▓"A$:PRINT"▓▓"A$
240 PRINT"▓▓▓"A$:PRINT"▓▓"A$
250 PRINT"▓▓▓"A$:PRINT"▓▓"A$
260 POKES2,0:POKEHA,15:A(1)=126:A(2)=108:A(3)=123:A(4)=124:R=0:O=0:V=23:Y=1
270 Z=7945+RND(1)*20
280 G=INT(RND(1)*2)
290 IFG=1THENR=1
300 IFG=0THENR=3
310 POKES1,0:PRINT"▓▓▓▓SCORE"SC
320 PRINT"▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓BALL NO"BA
330 IF BA<>0 THEN 340
332 PRINT"▓▓ANOTHER GAME ?;
333 GET A$:IF A$="" THEN 333
334 IF A$="Y" THEN RUN
335 IF A$<>"N" THEN 333
336 PRINT"▓▓":POKE 36879,27:END
340 POKES1,0:SYS7424
```

```
350 R=R+1
360 IFO=1THENIFR>4THENR=3:Z=Z+V:POKEZ-V,32:GOTO390
370 IFO=1THEN390
380 IFR>2THENR=1:Z=Z+V:POKEZ-V,32
390 X=PEEK(Z)
400 IFX=120THEN540
410 IFX=207THENK= 1:GOTO560
420 IFX=208THENK=-1:GOTO560
430 IFX=160THEN500
440 IFX=224THEN520
450 IFX=228THEN480
460 IFX=96THENBA=BA-1:POKES2,220:FORL=15TO0STEP-1:POKEHA,L:FORM=1TO200:NEXT:NEXT
:GOTO260
470 POKEZ,A(R):GOTO340
480 Y=1:POKES1,220:IFR=1ORR=2THENZ=Z+22:R=3:V=21:O=1:A(3)=124:A(4)=123:GOTO340
490 IFR=3ORR=4THENZ=Z+22:R=1:V=23:O=0:A(1)=126:A(2)=108:GOTO340
500 POKES1,220:IFR=1ORR=2THENZ=Z+1:R=3:V=-21:O=1:A(3)=123:A(4)=124:GOTO340
510 IFR=3ORR=4THENZ=Z+1:R=1:V=23:O=0:A(1)=126:A(2)=108:GOTO340
520 POKES1,220:IFR=1ORR=2THENZ=Z-1:R=3:V=21:O=1:A(3)=124:A(4)=123:GOTO340
530 IFR=3ORR=4THENZ=Z-1:R=1:V=-23:O=0:A(1)=108:A(2)=126:GOTO340
540 Y=0:POKES1,220:IFR=1ORR=2THENZ=Z-22:R=3:V=-21:O=1:A(3)=123:A(4)=124:GOTO310
550 IFR=3ORR=4THENZ=Z-22:R=1:V=-23:O=0:A(1)=108:A(2)=126:GOTO310
560 POKES1,200:POKEZ,32:POKEZ+K,32
570 IFZ<7812THENSC=SC+7:GOTO610
580 IFZ<7856THENSC=SC+5:GOTO610
590 IFZ<7900THENSC=SC+3:GOTO610
600 IFZ<7944THENSC=SC+1
610 POKE38400+Z-7680,1:POKE38400+Z-7680+K,1
620 IFSC/320=INT(SC/320)THEN210
630 IFY=1THEN540
640 Y=1
650 IFR=1ORR=2THENZ=Z+22:R=3:V=21:O=1:A(3)=124:A(4)=123:GOTO310
660 IFR=3ORR=4THENZ=Z+22:R=1:V=23:O=0:A(1)=126:A(2)=108:GOTO310
670 POKE36879,42:PRINT"♥QQ*** VIC BREAKOUT  ***
680 PRINT"QQYOU MOVE WITH :
690 PRINT"QQ↑CRSR↑ MOVE LEFT
700 PRINT"Q←CRSR← MOVE RIGHT
710 PRINT"QQQHIT ANY KEY
750 GETA$:IFA$=""THEN750
760 RETURN
770 POKE251,235:POKE252,31
780 POKE56,28:RUN790
790 FORI=7424TO7488
800 READA:POKEI,A:NEXT:RUN140
810 DATA164,251,173,197,0
820 DATA201,23,208,15,169
830 DATA249,56,237,58,29
840 DATA197,251,240,16,200
850 DATA132,251,208,11,201
860 DATA31,208,7,192,228
870 DATA240,3,136,132,251
880 DATA172,58,29,185,59
890 DATA29,145,251,136,16
900 DATA248,234,169,160,141
910 DATA228,31,169,224,141
920 DATA249,31,96,4,96
930 DATA120,120,120,96,0

READY.
```

Bandit 1

```
100 Q=5:SC= 50:GOSUB1170:PRINT"▣▣"SPC(7)"▣▣╭─────╮▣
110 PRINTSPC(7)"▣|▣     ▣|▣▣
120 A$=" ▣                          ▣
130 B$=" ▣  ▣▣▒▒▒▒▒▒▣▣ ▣▣▒▒▒▒▒▒▣▣ ▣▣▒▒▒▒▒▒▣▣  ▣ ▣ ▣
140 C$=" ▣ ▣                        ▣ ▣
150 PRINTA$:PRINTA$" ▣●":PRINTB$:PRINTA$" ▣ ▣":PRINTA$" ▣ ▣"
160 PRINT"▣▣ ▣▣▣▣▼▣▣ ▣ ▣▣ ▣|▣▣▄▣ "
170 PRINT" ▣▣ ▼ ▣ ▣ ▣ ▣|▣▣▄ ▣"
180 PRINTB$:PRINTA$" ▣ "
190 PRINTC$"▣ ▣"
200 PRINT" ▣ ▣  ▣OOOOOOOOOOOO▣  ▣  ▣
210 PRINTC$
220 PRINT" ▣ ▣  ▣*PBE  FRUIT*▣▣  ▣ ▣
230 PRINTC$
240 PRINT" ▣ ▣  ▣▣O▣▣"SPC(10)"▣▣O▣▣   ▣ ▣
250 PRINT" ▣ ▣  ▣▣O▣▣  P 50  ▣▣O▣▣  ▣ ▣
260 PRINT" ▣ ▣  ▣▣OOOOOOOOOOOO▣▣  ▣ ▣
270 PRINTC$:PRINT" ▣ Z=INSERT:S=START ":PRINT" ▣       1,2,3=STOP   "
280 C$="▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣▣"
290 CO=0:PRINTLEFT$(C$,12)"▣▣▣▣▣OOOOOOOOOOOO
300 GETA$:IFA$<>"Z"ANDA$<>"S"THEN300
310 IFA$="Z"THEN340
320 IFCO<>0ANDA$<>"Z"THEN390
330 GOTO300
340 IFCO=12THEN300
350 IFSC=0THEN300
360 CO=CO+1:PRINTLEFT$(C$,12)SPC(4)"▣"LEFT$("●●●●●●●●●●●●",CO)
370 SC=SC-1:PRINTC$SPC(7)"P"STR$(SC)" "
380 GOTO300
390 A$(1,1)="▣   ⁄⁄"
400 A$(1,2)="▣⁄⁄ ◡"
410 A$(1,3)="▣◡  ⁄⁄"
420 A$(1,4)="▣   ◡"
430 A$(2,1)="    "
440 A$(2,2)="▣  ◠  "
450 A$(2,3)="▣▣▼   ▼▣"
460 A$(2,4)="▣◡ ◡"
470 A$(3,1)="▣ ▣▼▣ "
480 A$(3,2)="▣╭●●╮"
490 A$(3,3)="▣| ◡ |"
500 A$(3,4)="▣╰───╯"
510 A$(4,1)="▣ ▣▼▣ "
520 A$(4,2)="▣═▣●●▣═"
530 A$(4,3)="▣  ▣▀▄"
540 A$(4,4)="    "
550 A$(5,1)="◣▒▒▒▒▒"
560 A$(5,2)="◣▣PBE▣▒"
570 A$(5,3)="◣▒▣PBE▣"
580 A$(5,4)="◣▒▒▒▒▒"
590 PRINT"▣▣▣▣▣"SPC(20);
600 FORI=1TO6:PRINT" ▣▣▣●▣▣";
610 FORJ=1TO40:NEXT:NEXT
620 FORI=1TO6:PRINT"▣ ▣▣▣●▣▣";
630 FORJ=1TO30:NEXT:NEXT
640 AH=0:BH=0:CH=0
650 IFAH=3THEN740
660 AP=AP+1:IFAP=5THENA=AR:AP=1
670 AX=A:AY=AP:AZ=AR
680 PRINT"▣▣▣▣▣"SPC(3)A$(A,AP)
690 FORI=1TO3:AP=AP+1:IFAP=5THENA=AR:AP=1
700 PRINTSPC(3)A$(A,AP):NEXT
```

```
710 IFAP=4ANDAH<>0THENAH=AH+1
720 IFAP=4ANDA=ARTHENAZ=INT(RND(1)*Q)+1
730 A=AX:AP=AY:AR=AZ
740 IFBH=3THEN830
750 BP=BP+1:IFBP=5THENB=BR:BP=1
760 BX=B:BY=BP:BZ=BR
770 PRINT"■■■■■■"SPC(8)A$(B,BP)
780 FORI=1TO3:BP=BP+1:IFBP=5THENB=BR:BP=1
790 PRINTSPC(8)A$(B,BP):NEXT
800 IFBP=4ANDBH<>0THENBH=BH+1
810 IFBP=4ANDB=BRTHENBZ=INT(RND(1)*Q)+1
820 B=BX:BP=BY:BR=BZ
830 IFCH=3THEN920
840 CP=CP+1:IFCP=5THENC=CR:CP=1
850 CX=C:CY=CP:CZ=CR
860 PRINT"■■■■■■"SPC(13)A$(C,CP)
870 FORI=1TO3:CP=CP+1:IFCP=5THENC=CR:CP=1
880 PRINTSPC(13)A$(C,CP):NEXT
890 IFCP=4ANDCH<>0THENCH=CH+1
900 IFCP=4ANDC=CRTHENCZ=INT(RND(1)*Q)+1
910 C=CX:CP=CY:CR=CZ
920 IFAH=3ANDBH=3ANDCH=3THEN980
930 GETA$
940 IFAH<>3ANDA$="1"THENAH=1
950 IFBH<>3ANDA$="2"THENBH=1
960 IFCH<>3ANDA$="3"THENCH=1
970 GOTO650
980 HT=0:XX=0:IFA=1THENXX=2
990 IFA=1ANDB=1THENXX=5
1000 IFA=1ANDB=1ANDC=1THENXX=10
1010 IFA=2ANDB=2ANDC=2THENXX=20
1020 IFA=3ANDB=3ANDC=3THENXX=50
1030 IFA=4ANDB=4ANDC=4THENXX=20
1040 IFA=5ANDB=5ANDC=5THENXX=100
1050 XX=XX*CO
1060 IFXX=0THEN1240
1070 PRINT"■";:FORI=1TOXX
1080 FORJ=1TO10:NEXT
1090 IFHT=0THENPRINT"■■■"SPC(8)"■  ■  "
1100 IFHT=1ORHT=5THENPRINT"■■■"SPC(8)" ■ ■"
1110 IFHT=2ORHT=4THENPRINT"■■■"SPC(8)"  ■ ■ "
1120 IFHT=3THENPRINT"■■■"SPC(8)"   ■  ■"
1130 HT=HT+1:IFHT=6THENHT=0
1140 SC=SC+1:PRINTC$SPC(7)"F"STR$(SC)
1150 NEXT:PRINT"■"
1160 PRINT"■■■"SPC(8)"     ":GOTO290
1170 AP=0:BP=0:CP=0
1180 A=INT(RND(1)*Q)+1
1190 AR=INT(RND(1)*Q)+1
1200 B=INT(RND(1)*Q)+1
1210 BR=INT(RND(1)*Q)+1
1220 C=INT(RND(1)*Q)+1
1230 CR=INT(RND(1)*Q)+1:RETURN
1240 IFSC<>0THEN290
1250 FORJ=1TO1000:NEXT
1260 PRINT"■■■■■■■■■■ ANOTHER GO (Y OR N) ?"
1270 GETA$:IFA$<>"Y"ANDA$<>"N"THEN1270
1280 IFA$="Y"THENRUN
1290 PRINT"■ THE END":END

READY.
```

DROP IN ON ALL THE BITS AND PIECES FOR YOUR VIC 20

SPECIAL

VIC DISK DRIVE	**£225.00**
VIC PRINTER	**£170.00**

NEW

Tempo di marcia

VIC MUSIC SYSTEM

- ★ PROVIDES A MEANS OF DEFINING AND PLAYING MUSIC USING THE THREE 'VOICES OF VIC'
- ★ FULL SCREEN MENUS, FOR MUSIC DEFINITION, AND MACHINE CODED ROUTINES TO CONTROL MUSIC PLAYING
- ★ VARIOUS DEMONSTRATION MUSIC PIECES
- ★ NEEDS 16K MEMORY EXPANSION

£15.00

TO HELP YOUR VIC GROW UP

MEMORY EXPANSION	
VIC 3K RAM	£23.00
VIC 8K RAM	£35.00
VIC 16K RAM	£56.00
PROGRAMMERS AID	£27.00
SUPER EXPANDER HI RES	£27.00
MACHINE CODE MONITOR	£27.00

EXPANSION BOARDS	
STACK 4 SLOT EXPANSION (INCLUDES EXTRA 3K)	£41.00
ARFON 7 SLOT EXPANSION (INCLUDES SEPARATE POWER SUPPLY AND LID)	£80.00

STORAGE DEVICES	
VIC C2N CASSETTE	£35.00

WORD PROCESSING

AUDIOGENIC WORDCRAFT 20 INCLUDES EXTRA 8K OF RAM WHICH CAN BE USED FOR OTHER PROGRAMS. FULL COMPATIBILITY WITH VIC 1515 PRINTER, PARALLEL AND RS232C PRINTERS WORKS ON DISK OR CASSETTE

ONLY £105.00

PRINTERS

VIC 1515	£170.00
OLIVETTI PRAXIS 35 12 cps DAISY WHEEL	£415.00
EPSON MX80	£280.00
MICROLINE 82A	£299.00

PRICES DO NOT INCLUDE INTERFACES

CARTRIDGES

OFFER ONE — ANY 3 FOR £45

- AVENGER
- STAR BATTLE
- SUPER SLOT
- JELLY MONSTERS
- ALIEN
- SUPER LANDER
- MOLE ATTACK

OFFER TWO — ANY 3 FOR £56

- SARGON II CHESS
- OMEGA RACE
- THE COUNT
- MISSION IMPOSSIBLE
- ADVENTURELAND
- PIRATE COVE
- VOODOO CASTLE

HARDWARE

VIC 20 ONLY	£135.00
COMMODORE 64	£279.00
INTRO TO BASIC PT 1	£12.00
INTRO TO BASIC PT 2	12.00

Comprehensive range of supplies, diskettes, ribbons listing paper etc.
All prices Exclusive of VAT
Showrooms open Mon-Fri 9-6pm Sat 9-1pm
FOR MAIL ORDER — orders up to £100 add £2 for P+P + insurance
— orders over £100 add £4 for P+P + insurance

SIMMONS MAGEE
TWICKENHAM

Simmons Magee Computers Ltd. 13 York Street, Twickenham Middx. 01-891-4477

Daily operator performance

Operator 200 Smith A. Shop A

Part no or activity	Op no.	Description	Qty	Current std hrs	Additional PRL	Total
P100	30	Depip	500	1.00	0.00	1.00
P100	40	1 S/G	320	.80	2.00	2.80
P100	50	Drill	120	.72	0.00	.72
P100	80	Stamp	300	1.60	0.00	1.60
					1.25	1.25
				4.12	3.25	7.37
				Clocked hours		8.00
				Performance %		92.12

you need an extra day or two for, say, painting, you will then change the job description.

There are of course many different departments under one factory roof. EPIC can handle 40 "centres" for each operation, although The Computer Room hopes to extend this capacity to 200 centres. Following the departmental idea to one of its logical conclusions, it is not hard to see that the principle can be adapted so that the headquarters of a company can keep track of its factories around the country.

Following the principle to another conclusion, the work rate of each department per machine per man can be analysed. It was this aspect of the system which The Computer Room had to be careful about when thinking up the names for their programs. Excess Time Analysis could not be called something like time wastage for fear of union wrath. But the title of the program does not hide the fact that the system should enable managers to sort out the shirkers from the workers and the departments that are worth keeping from those that should be closed down.

Records of worker or shop performance are available daily, weekly or monthly, each employee being categorised by shop and work number. For instance, Anthony Jones, shop A, work number 233 would appear on the operator list, with his total productivity displayed on the performance charts. Jobs are divided into how many working hours are available to each department.

Still it may happen that despite all the schedules the delivery date is not met. One solution to the problem is to introduce overtime, but this may be costly.

The Computer Room

The Computer Room

The Computer Room

Perhaps there is a bottle-neck in one department, leaving some workers with nothing to do. EPIC assesses where the hold-up is, using the performance information, and can be programmed to ensure that in the event of a bottle-neck workers can be switched from job to job with the minimum of fuss.

It should be remembered that the job card which is produced initially does not have to be adhered to as a strict working routine. It merely gives guidelines to help the production process.

When TCR exhibited EPIC in Birmingham recent-

```
                          CURRENT  METHOD

 NO  CTR   MACHINE          OPERATION DESCRIPTION              ABBREV S.M.V. EQ CU EST

 10   D WAREHOUSE      MATERIAL GOODS INWARDS INSPECTION  INSP   0.0000    0.0000
 20   A 1in WICKMAN    AUTO BLANK                         AUTO    .3000     .3000
 30   A LINISHER       DE-PIP                             DEPIP   .1200     .3000
 40   B STEINLE        GRIND LARGE LONG SIDE              1 S/G   .1500     .4500
 50   C 2 In WICKMAN   DRILL LARGE HOLE                   DRILL   .3600     .8100
 60   C C.C.MIACRON    1st C/LESS PASS HARD               1 H/G   .0600     .8700
 70   A 2 In WICKMAN   DRILL SMALL HOLE                   DRILL   .3600    1.2300
 80   B HARE PRESS     STAMP FORD                         STAMP   .1200    1.2300
 90   C CINCINNATI     MILL NOTCH                         MILL    .3600    1.6000
100   D GUAGE RIG      CHECK STRAIGHTNESS                 STRT    .0600    1.6600
110   A LINISHER       DE-PIP                             DEPIP   .1200    1.8100
120   D WAREHOUSE      CLEAN OIL PACK                     PACK    .0100    1.8200

                                                          TOTAL   2.0200
```

MASTER

MASTER is a totally new concept... a complete package for program development. Used by top professionals in the USA and Europe, MASTER has everything you need to write your own software, to the highest professional standards... up to 85 new commands that work with CBM Basic IV... and just one command can replace whole paragraphs of Basic code. That's why Master is...

a new concept in CBM Basic

MASTER has 17 DISK HANDLING commands (both keyed and sequential access, masked retrieval, batch operation, existence tests, etc)... 12 INPUT MANAGEMENT commands (input/output screen zones, with alpha, numeric and date formatting, etc)... 8 SCREEN MANAGEMENT commands (with screen pages loadable from disk or memory)... 10 commands for REPORT MANAGEMENT (with disk-loadable report formats)... 18 BUSINESS BASIC commands (with 20-place arithmetic, data compression, automatic date control etc)... and on the CBM 8096, all the features of PM96 (46K for programs, 26K for variables, as well as 17 BASIC UTILITY commands).

MASTER supports the CBM 8032/8096, 8032+CP/MAKER, and 4040/8050/8250 floppy disks, plus CBM 9060/9090 hard disks, and is supplied with a User Reference Manual, Quick Reference Guide, Demo Disk, and with a key for either cassette port. Supplementary RUN-TIME keys are available for multiple users and software houses.

PM 96

At last you can program the full capacity of the CBM 8096, with 53K for programs (up to 15 simultaneously) and 26K for variables (maintained even while editing or loading)... and use 17 new Basic commands as well, including all the TOOLKIT commands, plus PRINT USING, IF-THEN-ELSE, STOP KEY disable, HARDCOPY screen dump, CALL, FETCH, PLOT (50 by 150), WINDOW, and more. PM96 comes with a User Reference Manual, Quick Reference Guide, Disk with demo programs, and UD11 Support Rom.

Superscript

is the ultimate CBM wordprocessor! Wordpro-compatible (except for price)... with up to 20,000 characters of text, and 240 characters screen format... and no Roms or dongles to instal! SuperScript has been adopted by Commodore for their new models... and is now joined by SUPERSPELL, a 30,000 word disk dictionary, which easily verifies the largest Superscript (or Wordpro) document in 80 seconds... and user-defined words can be added. SUPERSCRIPT and SUPERSPELL suit most CBMs, disks and printers, and letter-quality printers.

These are just three fine products from our CBM/PET range... please telephone or write for our comprehensive data sheets:

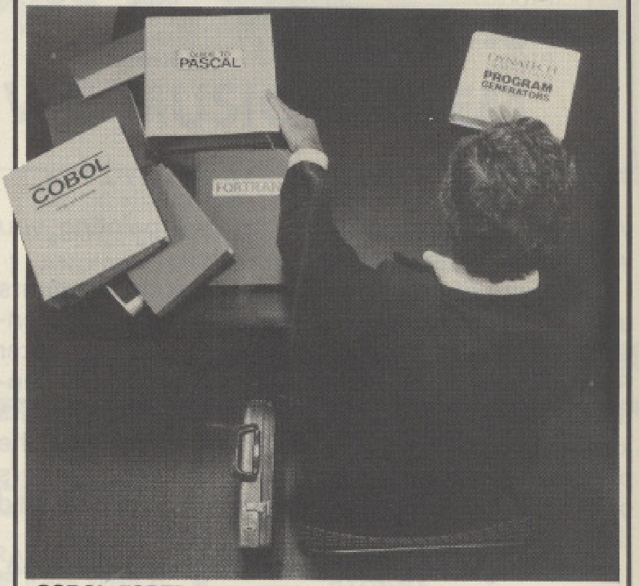
MASTER Program Development System	*£300.00*
MASTER Additional run-time keys	*£45.00*
PM96 96K Memory Management/Basic Enhancement	*£99.50*
SUPERSCRIPT The Ultimate CBM Worprocessor	*£249.00*
SUPERSPELL Disk Dictionary/Spelling Checker	*£150.00*
VIC SCREEN Screen management/Dos Support etc	*£49.50*
KRAM Keyed Disk Access (state which disk)	*£86.95*
COMMAND-O (for Basic IV, state which Pet)	*£59.95*
DISK-O-PRO (Adds Basic IV etc to Basic II)	*£59.95*
SPACEMAKER 4-Rom adaptor (not for 8096)	*£29.95*
VISICALC 32K/96K RRP £180.00, less £35.00	*£145.00*

ORDERING INFORMATION: Add 15% VAT to quoted prices. Order by post, telephone or Prestel, using cheque, ACCESS or BARCLAY card. For same-day service, telephone 01-546-7256. For over-the-counter sales, see your Commodore Dealer. (Ref AD10)

Calco Software

LAKESIDE HOUSE, KINGSTON HILL, SURREY, KT2 7QT. TEL 01-546-7256

Get with it!



COBOL, FORTRAN, PASCAL & other complexities of the past ...forget them!

Design and write your own systems in ENGLISH with

DYNATECH'S PROGRAM GENERATORS

Professionals can increase their output tenfold and novices can learn how to write professional programs in minutes using Codewriter* or Techwriter* — now selling worldwide.

What are the benefits?

- Save time...up to 90%
- Improves efficiency
- Provides information, faster
- Any member of staff can operate them
- User modifiable programs can be compiled for high speed operation

We have Program Generators available now for Apple II, III*, CP/M*, CBM Pet*, Sirius* and Osborne* - with more to come.

Seminars are held in London and other major cities throughout the year.

DYNATECH
MICROSOFTWARE LTD
Summerfield House, Vale, Guernsey, Channel Islands.
Telephone: 0481 45934 Telex: 4191130

Please send me details on Dynatech's Program Generators.

What type of microcomputer do you have or are considering purchasing?______________

Name ______________

Address ______________

Telephone no. ______________

CC

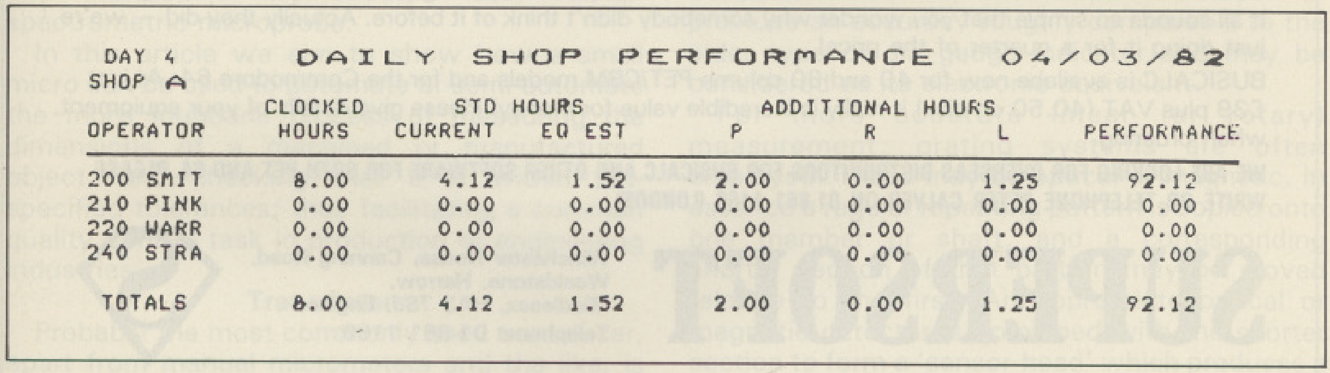
*registered trademarks

ly, according to TCR's Mike Meakings, the reaction was encouraging. The package costs £10,500, including the hard disk unit, thus underpricing any of its nearest rivals by a long way. Technicians at Commodore Business Machines who tested the package could find no flaws. EPIC is now a Commodore approved product as well as being part advertised by Commodore.

Selling direct to customers, without the help of national dealers, TCR hope to sell at least two EPICs every six weeks.

A useful package carefully planned and executed. Considering its cost, though, customers will need to consider how many of the 40 operations are relevant to them before they buy.

The Computer Room is at 87 High Street, Tonbridge, Kent TN9 1RX. (telephone 0732-355962).



```
DAY 4       D A I L Y   S H O P   P E R F O R M A N C E     0 4 / 0 3 / 8 2
SHOP A
            CLOCKED        STD HOURS          ADDITIONAL HOURS
OPERATOR     HOURS    CURRENT    EQ EST      P        R        L     PERFORMANCE

200 SMIT     8.00      4.12      1.52      2.00     0.00     1.25     92.12
210 PINK     0.00      0.00      0.00      0.00     0.00     0.00      0.00
220 WARR     0.00      0.00      0.00      0.00     0.00     0.00      0.00
240 STRA     0.00      0.00      0.00      0.00     0.00     0.00      0.00

 TOTALS      8.00      4.12      1.52      2.00     0.00     1.25     92.12
```

KINGSLEY COMPUTERS LTD.
132 Desborough Road
HIGH WYCOMBE, BUCKS HP11 2PU

CBM BUSINESS SYSTEMS

VIC HOME COMPUTERS

COMPUTER ACCESSORIES AND SUPPLIES

AGENTS FOR CBM APPROVED PRODUCTS

COMMODORE SERVICE CENTRE

MIDLANDS

COMMODORE PET SERVICE CENTRE

Phone Anne on 021-772 8181 about our

1. WORKSHOP & FIELD REPAIRS
2. BUSINESS SOFTWARE
3. STATIONERY & SUPPLIES

CBS CONSULTANTS
COMPUTER BUSINESS SYSTEMS

75 Watery Lane, Birmingham B9 4HW.
Telephone: 021-772 8181 (7 Lines)

BUSICALC COSTS £39!

If your Commodore computer has at least 32K of memory disks, and you're prepared to spend nearly £200 on a 'spreadsheet' program then you really ought to consider VISICALC. It's a superb program.

If however you're not able to run VISICALC on your system, or are not prepared to invest such a large sum of money you ought to take a look at BUSICALC. It not only sounds familiar, it looks much the same and has a similar range of facilities. All you need is 16K of memory and a cassette unit or disk drive. A printer will be useful, but it isn't essential.

Whether you use your computer in an office or at home, in industry or at university, BUSICALC can make it an even more powerful tool. It can handle jobs that would otherwise require a specially written program — or hours and hours of tedious paperwork. Just fill in the numbers that you know, then tell BUSICALC how to work out the others by entering simple formulae. BUSICALC can add or subtract, multiply or divide, calculate roots or powers, and perform special functions like totalling or averaging rows and columns. You can enter text on the sheet (for column headings, titles etc) and specify the number of decimal places for each calculated value — so with the help of a printer you can produce really smart reports.

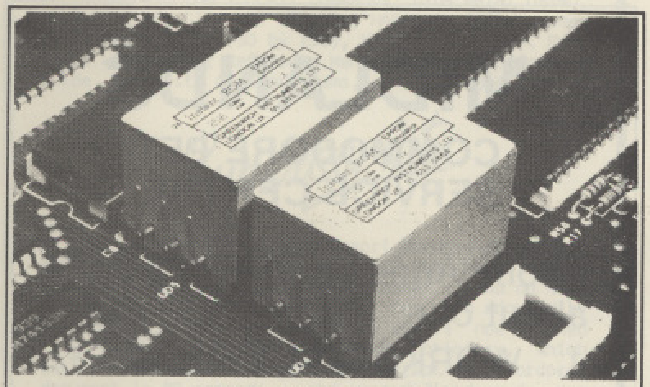
BUSICALC 'sheets' can be saved to disk or tape for subsequent reworking, or access by other programs. It all sounds so simple that you wonder why somebody didn't think of it before. Actually they did — we're just doing it for a quarter of the price!

BUSICALC is availabe now for 40 and 80 column PET/CBM models and for the Commodore 64. At just £39 plus VAT (40.50 on disk) it really is incredible value for money! Please give details of your equipment when ordering.

WE ARE LOOKING FOR OVERSEAS DISTRIBUTORS FOR BUSICALC AND OTHER SOFTWARE FOR BOTH PET AND 64. PLEASE WRITE OR TELEPHONE PETER CALVER ON 01-861 1166 (LONDON).

SUPERSOFT

Winchester House, Canning Road,
Wealdstone, Harrow,
Middlesex, HA3 7SJ, England
Telephone: 01-861 1166



"INSTANT ROM"

"Instant Rom" ROM/EPROM EMULATORS contain CMOS RAM with internal battery backup. When the power is switched off, data is retained for up to 10 years.

In the PET, a 4K INSTANT ROM can be fitted in the $9000 or $A000 socket. Machine-code (and Basic) programs can be stored, and are available at switch-on.

INSTANT ROM saves time. It can be used for long periods; when the program is finally "bug-free", an EPROM can be programmed.

4K INSTANT ROM (ROM socket replacement)	£56.00
2K INSTANT ROM (character generator replacement)	£39.00
Adaptor GA1 (essential for PET users)	£6.00

"G-ROM E"

G-ROM E is a 4K EPROM which will Auto-run, at switch-on, any Basic or Machine-Code program stored in INSTANT ROM. Basic programs can be stored with a few quick key-strokes. No skill is needed. Programs can now be run without a tape or disk unit, and can be changed without cost to the user. Diagnostic aids are included.

G-ROM E (specify type of PET)	£25.00

Postage (£1.00) and VAT are extra. Leaflets are available.

"INSTANT ROM" and "PETCLOCK" are COMMODORE APPROVED PRODUCTS.

GREENWICH INSTRUMENTS LIMITED, 22 BARDSLEY LANE, GREENWICH, LONDON SE10 9RF, UK. Tel: 01-853 0868. Telex: 896691 Attn. GIL.

HI-RESOLUTION GRAPHICS

A high resolution graphics board that gives a 64,000 dot (320×200) resolution. Versions available for any dynamic ram Pet, BASIC 2,3,4, FAT40 & 80 columns. No soldering or track cutting required, supplied complete with fast GRAPHIX software in ROM and full fitting & operating instructions. **£149.00**

SUPER ROM-SELECTOR

A high quality printed circuit board giving 64K of utility ROM space, software selectable!!! Allows 16×4K ROMs/EPROMs to reside in the expansion area of your PET. One 'POKE' enables any two ROMs at a time. Suitable for bank-switched software. £75.00

PET UPGRADES

WHILE-U-WAIT service! (Dynamic ram pets only).

Memory expansion:

8K-32K	£59.90
16K-32K	from £48.70
8K-16K	£38.26

40 column (12in VDU only) to 80 column conversion.

40-80 column	£89.00
40-80 column switchable (two machines in one!)	£105.00

Full keyboard functions: i.e. TAB, ESC, REPEAT, SCROLL up/down, define WINDOW, lowercase/graphics mode and DELETE from/to cursor. All available in direct or program mode.

REPAIRS AND SERVICING

Fast and efficient repairs to all Commodore Business Machines at reasonable prices. WHILE-U-WAIT service whenever possible.

Please add VAT to the prices shown at the current rate.

Telephone Mick Bignell for more details at:

7 Clydesdale Close,
Borehamwood, Herts. WD6 2SD.
Tel: 01-953 8385

Gauging systems based on microcomputers

Dr K. T. Kibasi and Dr A. Mills

Microcomputers and microprocessors play an increasingly important role in measurement and instrumentation. In previous articles we have shown how Commodore microcomputers can be used to generate and control complex waveforms and monitor a sophisticated laser Raman spectrometric microprobe.

In this article we aim to show how a small micro can be used to automate or semi-automate the more mundane process of measuring the dimensions of a machined or manufactured object, and checking that it is within pre-specified tolerances; thus facilitating a common quality control task in production or engineering industries.

Transducers

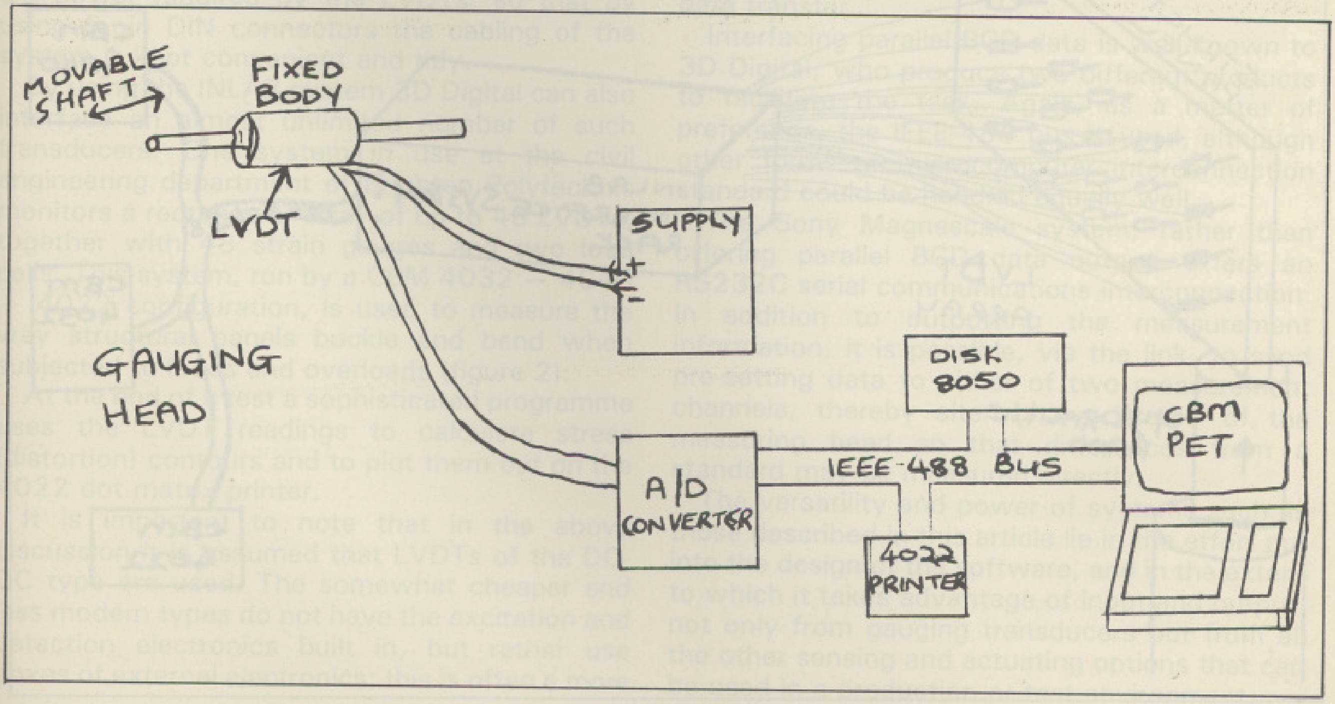
Probably the most commonly used transducer, apart from manual micrometers and the like, is the linear voltage displacement transducer. In the LVDT a spring-loaded shaft can be moved in a straight line in and out of a cylindrical body. The fixed body houses a small electronic package which converts the linear movement into a proportional DC voltage.

This package includes an oscillator, a transformer whose coupling varies with the shaft position, a precision rectifier and an output amplifier. This type of LVDT takes a DC supply voltage on two wires and returns a DC signal of the order of 100mV on two more wires. It provides an accuracy roughly comparable to the older type of dial-gauge indicator and may be considered as its electronic equivalent.

For more accurate linear (or rotary) measurement, grating systems are often employed. These may be optical or magnetic. In essence a regular repeating pattern is copied onto one member or shaft, and a corresponding shorter section of that pattern may be moved relative to the first. An appropriate optical or magnetic detector is combined with the shorter section to form a 'sensor-head' which produces a sine wave or pulse output when moved. The effect is analogous to that produced when two combs are held up to the light and one moved behind the other.

Special circuitry, usually supplied with commercially available forms of these gauging transducers, counts the pulses and provides a digital display of the measured displacement in the appropriate units. These forms of gauging

Dr K. T. Kibasi and Dr A. Mills are senior researchers at 3D Digital Design & Development in London.



apparatus invariably offer the digital information as an output available through a rear panel multi-way socket, either as serial or parallel.

In so far as LVDTs provide an analog signal linearly proportional to displacement, all that is necessary to allow a Commodore PET to monitor their output is a suitable analog-to-digital converter.

Accuracy and resolution

A word about accuracy and resolution is relevant here. The resolution of an analog-to-digital conversion process is a measure of the number of discrete steps into which the analog voltage (or displacement) scale is subdivided. Thus, for instance, if an 8-bit A/D converter is used with an LVDT having a stroke of about an inch (say 25.6mm) then the system could resolve down to 0.1mm i.e. 1 part 256 (1 part in 2^8).

The accuracy of such a system would be somewhat lower, the degradation depending on many factors, including the transducer. But no matter how good everything else is, the accuracy can never be better than the resolution. The above example would be hopelessly inadequate for many commonplace engineering measurements; 12-bit resolution (giving 1 part in 4096) or even 16-bit would be necessary to provide finer and ultimately more accurate measurements.

If we use high resolution A/D converters connected to the CBM via the IEEE-488 bus, then a program running in the PET can take a reading of the displacement signal at any moment determined by that program. The essentials of such a system are represented in figure 1.

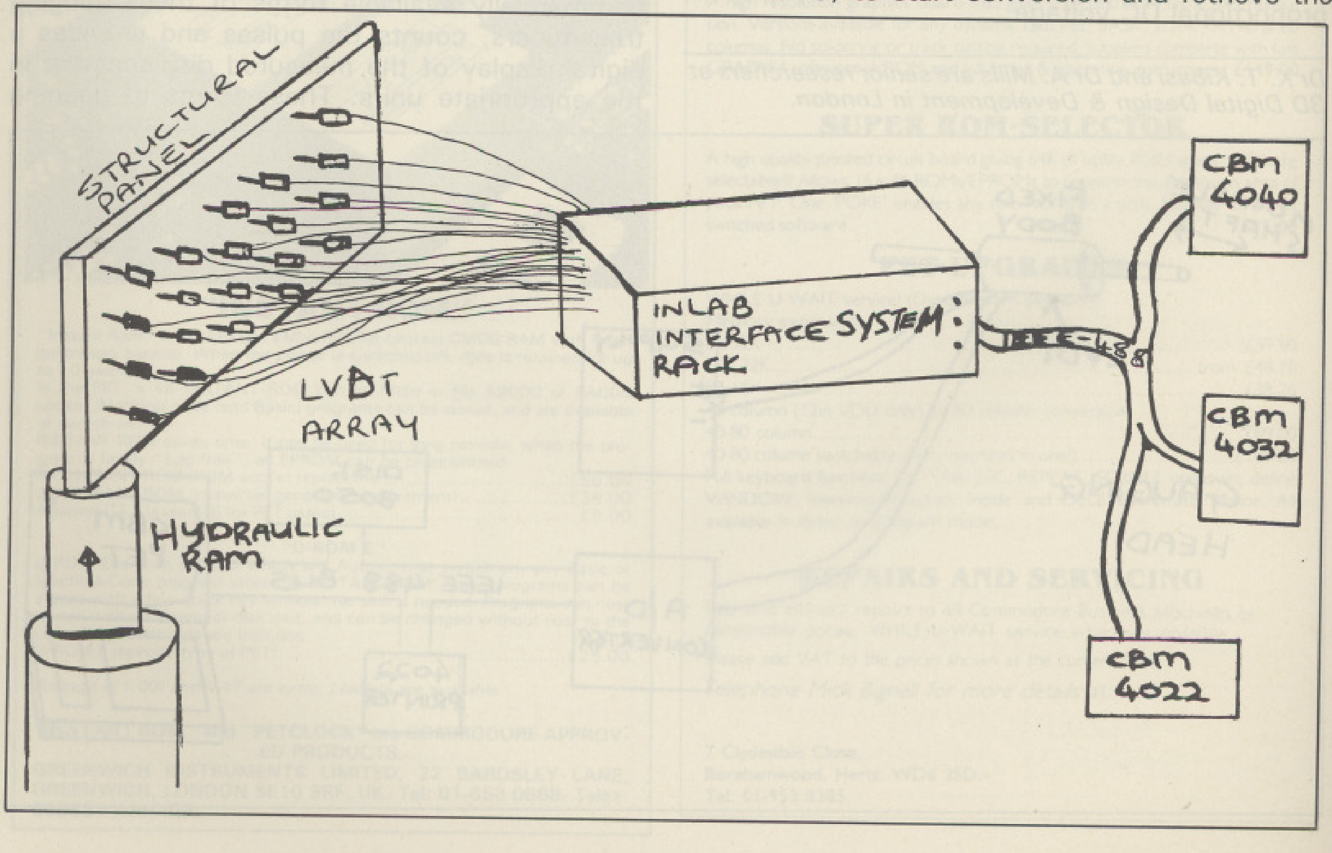
One advantage of using an A/D converter on the IEEE-488 bus is that the I/O programming is relatively straightforward. There follows a subroutine to select a channel and take a reading using one of 3D Digital's 8-channel 12-bit converter units:

```
10     OPEN 2,7,6 : OPEN 3,7,20 : OPEN 4,7,24

210    REM MAIN PROGRAMME
220    I=2 : GOSUB 6000 : REM SELECT LVDT;
       TAKE MEASUREMENT
230    L=K(I)*R : REM SCALE RESULT TO GET
       LENGTH

5999   REM A/D CONVERTER SUBROUTINE
6000   OPEN 1,7,I : REM CHANNEL SELECT
6010   GET#1,A$ : GET#1,A$ : GET#3,AS$ :
       GET#4,B$
6020   A=ASC (A$+CHR$(O)) :
       B=ASC(B$+CHR$(O))
6030   B=BAND 240 : B=B/16 : R=B+A*16 :
       REM RECONSTRUCT RESULT
6040   RETURN
```

The OPEN statements at the head of the program relate to secondary addresses issued at line 6010, to start conversion and retrieve the



12-bit result in two successive bytes (A and B). The result, R, of the A/D conversion, a number from 0 to 4095, is multiplied by an appropriate scaling or calibration factor K(I) on return to the main programme.

This subroutine could be used to handle a system of eight LVDTs connected to one such A/D converter unit. These could be mounted on a jig which is fitted over the object to be gauged, or into which the object is placed, so that several dimensions may be gauged virtually simultaneously. Alternatively different LVDTs might be used for several different products, possibly even on nearby production lines or test stations. The structure of the above program allows for transducers with different sensitivities and strokes to be used.

The measurement may be easily initiated by pressing a button or foot-switch or by closing a microswitch contact at the test jig; this could be sensed via a spare input channel if desired. Alternatively the PET keyboard could be used following an operator screen prompt message.

Alarm indication

Having taken the reading, the program may test the measured value against the expected reading from that channel, and produce an error or alarm indication if the reading is outside the permitted pre-set tolerance limits. The results may be printed to screen or printer, saved on disk or used to give a go-no-go audible indication.

The standard 3D Digital 8-channel 12-bit A/D converter unit can provide the small amount of DC power required by the LVDTs, so that by using 5-pin DIN connectors the cabling of the system is kept convenient and tidy.

By using the INLAB system 3D Digital can also interface an almost unlimited number of such transducers. One system in use at the civil engineering department of Brighton Polytechnic monitors a rectangular array of up to 48 LVDTs, together with 48 strain gauges and two load cells. This system, run by a CBM 4032 — 4040 — 4022 configuration, is used to measure the way structural panels buckle and bend when subjected to loads and overloads (figure 2).

At the end of a test a sophisticated programme uses the LVDT readings to calculate stress (distortion) contours and to plot them out on the 4022 dot matrix printer.

It is important to note that in the above discussion it is assumed that LVDTs of the DC-DC type are used. The somewhat cheaper and less modern types do not have the excitation and detection electronics built in, but rather use boxes of external electronics; this is often a more expensive and less convenient way of using LVDTs, but similar A/D conversion principles can still be used if care is taken over channel switching.

When maximum accuracy is desired in gauging-type measurements, the previously mentioned grating principle is generally employed, either in its optical form, perhaps using Moire fringes, or magnetically using patented phase detection methods.

One commercially available product of the first type is that manufactured by the German company Heidenhain. A magnetic system is produced by Sony under the trade name Magnescale. 3D Digital have interfaced systems from both of these manufacturers as well as a few others.

> The versatility of microcomputer-based gauging systems lies in the effort put into the design of the software and in the extent to which it takes advantage of input and output

In the case of the Heidenhain, a highly accurate system giving a display of eight digits, the digital information is available in the form of parallel TTL (transistor-transistor-logic) binary-coded-decimal (BCD) signals on a rear-panel multi-way connector. When connecting this to a microcomputer such as a PET, the problem is that of bringing in more than 32 logic lines together with additional control signals to synchronise the data transfer.

Interfacing parallel BCD data is well-known to 3D Digital, who produce two different products to facilitate the task. Again, as a matter of preference, the IEEE-488 bus is used, although other forms of microcomputer interconnection standard could be handled equally well.

The Sony Magnescale system, rather than offering parallel BCD data output, offers an RS232C serial communications interconnection. In addition to outputting the measurement information, it is possible, via the link, to send pre-setting data to either of two measurement channels, thereby altering the "zero" of the measuring head so that differences from a standard may be measured directly.

The versatility and power of systems such as those described in this article lie in the effort put into the design of the software, and in the extent to which it takes advantage of input and output, not only from gauging transducers but from all the other sensing and actuating options that can be used in a production or test environment.

Basic programming in eight short nights

For many people the microcomputer revolution began in earnest some five years ago with the introduction of the first PETS and Apples, but in reality it had started many years earlier: these machines did not simply spring up overnight.

To the computer users involved at the time, everything can be placed in its right perspective and the situation as a whole nicely reviewed with the advantage of hindsight. But to many of the youngsters (and indeed, those not so young) who have recently become part of the personal computer world, attitudes fall into one of two categories: a) it was a miracle that it ever happened in the first place, or b) it is all taken totally for granted.

Both of these views are wrong; to try and correct them, we feature here a book that is as old as the first PET itself: *Basic and the Personal Computer.*

Value as a document

But surely a book that is five years old cannot possibly be of any use to the new owner of a VIC, Spectrum, or any other modern microcomputer? Nothing could be further from the truth.

Thomas Dwyer's book contains some important background notes revealing the concept of the microcomputer and how it came into being. He reminds us, for example, that when the book was written the PET and the Apple were the only two micros around that came in anything like a complete form. Before then we had user-assembled kits that had to be painstakingly put together. That was part of the fun; if the machine worked, eureka! Most of them didn't even have Basic on board; it had to be loaded in before you could do anything.

If the book contained nothing else, it could be recommended as an interesting introduction to microcomputers. Almost an historical textbook, in fact. But it contains a lot more that is still useful and relevant today.

Ground covered

The second chapter is called "The eight hour wonder: all about basic programming in one long day (or eight short nights)" and really is just that.

Although aimed at no Basic dialect in particular, it limits itself to a minimal Basic that would be common to a lot of different micros. On occasion it will descend (ascend?) to IF . . THEN . . ELSE . . statements much beloved by COMAL enthusiasts, but will still tell you how to convert that to normal Basic.

So it is with any new deviation from the minimal Basic path: you're always told how to put the same code into a universal Basic, and from there it's an easy enough task to put it into pure PET style.

From that crash course in programming we go on to separate topics such as simple graphics and computer art, word processing and data bases, sorting techniques and computer games, simulations and extending microcomputers, all written in an informal and informative style.

There are many program examples in each chapter, each one thoroughly annotated to let you know what's happening all the time, and throughout the book there are numerous exercises for you to try out yourself. Usually the answers are given towards the end of the next chapter, but every now and then it leaves you high and dry and wishing the author had written a follow-up.

Confining itself as it does to this minimal Basic, it would make an excellent study book for a school or college giving a grounding in programming, but with a number of different computers to cover. This book would do for all of them, rather than having to obtain specialist textbooks for every third or fourth computer.

You will not become the world's greatest programmer; nor will you learn anything about machine code programming. On the other hand, it will take you further than many more recent "programming aid" books, it contains fewer errors than most, and is easier to read and follow than most of them as well.

Conclusion

To be recommended. Most of the publications that allegedly teach you to program a computer are written to earn a quick buck, but this one is obviously a labour of love.

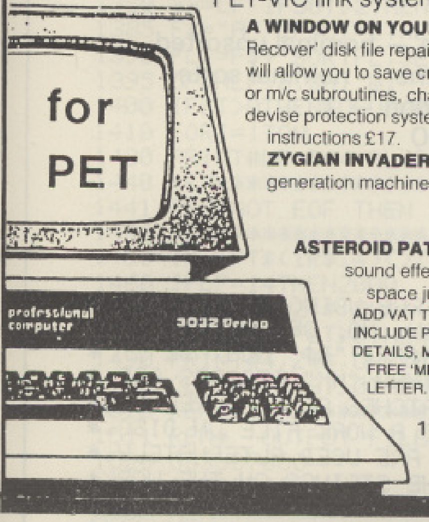
If you want specialist information, consult the manual you get. If you want a broad programming background and want to know what your computer can do, get this as well.

Title:	*Basic and the Personal Computer.*
Author:	*Thomas Dwyer (with illustrations by Margot Critchfield).*
Publisher:	*Addison-Wesley*
Address:	*53 Bedford Square, London WC1B 3DZ.*

'SIMPLY WRITE': the kind of word processor you didn't think you could afford. Some £300 programs have fewer facilities. Tape or disk; any printer; any 40 or 80 column PET. Needs 16K. Tape £40, disk £45.

'SIMPLY FILE' Records System (DBMS). Selects by any key. Prints alphabetical lists, mailing labels, columnar reports of all or selected records. Calculates between fields. Totals, averages columns. Works with 'Simply Write'. Fast, easy, robust and very, very versatile. Disk £65.

GOTTA PET? ADDA VIC! High resolution graphics, programmable characters, colour and sound for your PET/CBM system? All this PLUS a complete extra computer using your PET's disk drives, printer etc? Under £200 including VIC computer and our 'SIMPLY LINK' PET-VIC link system.



A WINDOW ON YOUR DISK! Our 'Simply Recover' disk file repair kit (4040 only at present) will allow you to save crashed files, append BASIC or m/c subroutines, change disk names and IDs, devise protection systems, etc. Disk & detailed instructions £17.

ZYGIAN INVADERS. Super second generation machine code invaders game. Tape £6, disk £7.50

ASTEROID PATROL. Classic game with sound effects, 9 levels of play, hyper-space jump etc. Tape £6, disk £7.50

ADD VAT TO PRICES PLEASE, BUT ALL INCLUDE P&P. SEND FOR MORE DETAILS, MORE ITEMS, AND GET OUR FREE 'MICROMAIL' PET/VIC NEWSLETTER.

Simple Software Ltd.
15 Havelock Rd., Brighton.
Sussex BN1 6GL
Tel: (0273) 504879

CBM/PET "IEEE BUS" ROM

Available now — the RHOMBUS B.O.S. 4K ROM with 125 page MANUAL

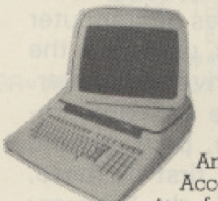
B.O.S. adds 56 commands to BASIC making the CBM/PET a versatile, general purpose BUS CONTROLLER. Uses *no* resident "bus software". Gives an "on screen" data bus MONITOR. Allows binary, hex, BCD and ASCII DATA with PET memory or BASIC variables. Polling, SRQ and ALL bus COMMANDS implemented. Reliable Bus"GET#". String variable input of full 255 bytes (including the null byte). Bus data transfers from/to addressed memory blocks and no "time outs".

For CEM Disk Drives B.O.S. enables data compression on disk and much faster data rates than PET DOS with large numeric data sets.

Available for 2001 to 8000 and SP9000 series CBM/PETs. Price £83 — Delivery normally Ex-stock. State value of PRINT PEEK (50000) if ordering or send 9×4 SAE for detailed BOS DATA SHEET/DISK APPLICATIONS NOTES.

RHOMBUS (CC),
87 Bourne Way, Hayes, Kent, BR2 7EX.

You're just one step away from one-step accounting



Anagram Systems' Integrated Accounts is, simply, the most comprehensive, easiest to understand integrated accounting package available to Commodore users. It is the best reason yet for choosing Commodore.

And now there is Anagram Integrated Accounts with integrated Stock Control – on top of superb Anagram standalone Stock Control and ledger packages. Just look at these features and options.

Full integration: Anagram Integrated Accounts consists of Sales, Purchase and Nominal Ledgers, Cash Book, and functions which permit journal entries, file maintenance and report printing in remarkable detail. All these are automatically updated when you make an entry. In the version with Stock Control, creating an invoice updates the stock as well as the other modules.

Single- or multi-user: Anagram Integrated Accounts, with or without the integrated Stock Control, can be supplied either single-user, or multi-user for up to five machines for only £300 extra per machine. The same goes for Anagram Stock Control.

Hard disk or floppies: Integrated Accounts is on just one floppy disk – compare that to competitive packages – and runs successfully with the Commodore twin disk units. Integrated Accounts with Stock Control and Sales Order Processing ideally requires a hard disk.

Open Item or Balance Forward: Choose which system you want for each account – you can even mix the two.

Extensive analysis: Each sales invoice can be analysed across ten nominal headings; each purchase invoice across eight. You can set up budgets within each nominal heading to get comparisons of 'budget to actual' at any time.

Easy to understand, learn and use: Anagram Accounting and Stock Control packages are designed for busy people who don't want to mess about with computers. They use ordinary book-keeping terms without jargon.

Your Commodore dealer should have these packages ready for demonstration. If not, phone Anagram and we will fix a demonstration for you. Or send the coupon.

ANAGRAM SYSTEMS
60A, Queen Street, Horsham, West Sussex
RH13 5AD. Tel. (0403) 50854/58153

To: Commodore Special Promotions Department, 675 Ajax Avenue, Trading Estate, Slough, Berkshire SL1 4BG.
Telephone: Slough (0753) 79292.

Send me brochures on the Anagram packages I have ticked and tell me where to see them running.

☐ Integrated Accounts with Stock Control ☐ Integrated Accounts
☐ Standalone Stock Control ☐ Standalone Ledgers

Name ____________
Position ____________
Company ____________
Nature of business ____________
Address ____________
____
County ____________ Postcode ____________
Telephone No. ____________
Any existing CBM computer ____________

commodore COMPUTER

CBM is a trademark of Commodore Business Machines (UK) Ltd

AN/CCO/03

A complete nominal ledger system for accountants

Part 2: Sort programme.

The editors of *Commodore Computing International* have developed a series of computer systems for accountants, for use with the Commodore 4000 with disk drive and printer.

The nominal ledger package contains programs for entry, sort, update, print, amend descriptions and filesort. The first of these, the entry program, appeared in the February issue.

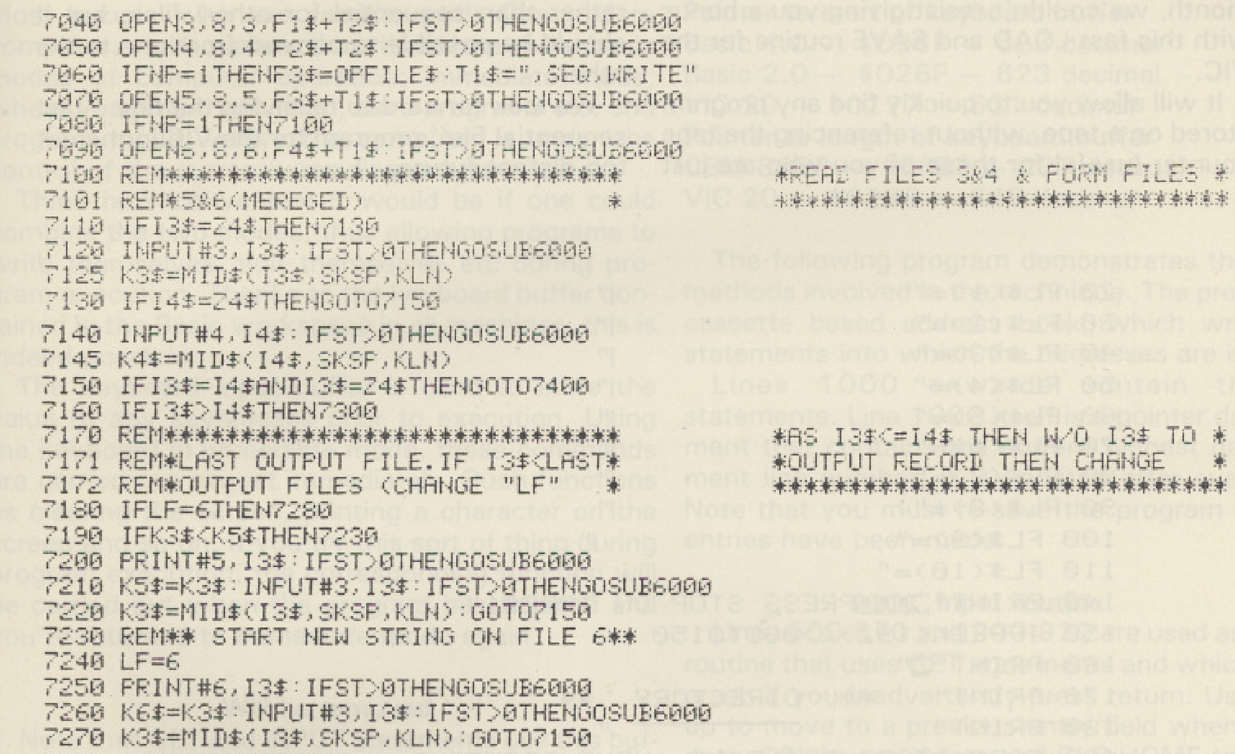
The sort program that follows will display and print the input and output file names together with the narrative, as well as a display indicating the current state of the sort. When finished the number of records sorted will be displayed and printed. The parameters for this sort will be held on the parameter file as follows:

a) Input file name — nominal unsorted
b) Output file name — nominal sorted
c) Start key position — 1
d) Narrative — 30

```
10 REM********************************                * SORT/MERGE USING I/O FILES    *
11 REM*ON DISC.VARIABLE "MX" MUST BE *                *SET TO MAX. NO. OF RECORDS     *
12 REM*THAT CAN BE SORTED IN CORE.   *                *TABLES "A$" & "B$" MUST BE     *
13 REM*DIMENSIONED AS "MX+2" & "MX". *                *IF MORE THAN "MX" RECORDS ARE *
14 REM*TO BE SORTED THEY WILL BE SORT*                *-ED IN BATCHES OF "MX" RECORDS*
15 REM*& EACH SORTED STRING WILL BE  *                *COPIED TO A WORK FILE ON DISC.*
16 REM*TW0 WORK FILES ARE USED FOR   *                *OUTPUT & ARE USED ALTERNATELY.*
17 REM*WHEN ALL RECORDS HAVE BEEN    *                *SORTED THE STRINGS ON THE WORK*
18 REM*FILES ARE MEREGED TO FORM THE *                *SORTED OUTPUT FILE.            *
19 REM* (SEPTEMBER 1979)             *                ********************************
1000 DIMA$(256),S(10),B$(254):Z4$="ZZZZ":MX=254:FT$="Y"
1020 OPEN1,8,2,"1:PARAMETERS,SEQ,READ"
1030 IFST>0THENGOSUB6000
1040 INPUT#1,IR$
1060 IFLEFT$(IR$,4)="ZZZZ"THENPRINT"▒NO SORT CONTROL RECORD":STOP:GOTO1020
1070 IFLEFT$(IR$,4)<>"SORT"THEN1040
1080 IFMID$(IR$,5,4)<>"NOM1"THEN1040
1089 REM******************************                  *SORT CONTROL RECORD READ     *
1090 REM*STORE I/O FILE NAMES & START*                  *& LENGTH OF SORT KEY         *
1091 REM******************************
1100 OPEN10,8,15
1110 SKSP=VAL(MID$(IR$,49,2)):CLOSE1
1115 KLN=VAL(MID$(IR$,51,2)):IPFILE$=MID$(IR$,9,15):OPFILE$=MID$(IR$,29,15)
1117 IFRIGHT$(IPFILE$,1)=" "THENIPFILE$=LEFT$(IPFILE$,LEN(IPFILE$-1):GOTO1117
1118 IFRIGHT$(OPFILE$,1)=" "THENOPFILE$=LEFT$(OPFILE$,LEN(OPFILE$)-1):GOTO1118
1120 REM******************************
1121 REM*  OPEN INPUT FILE & STORE   *                  *RECORDS IN "B" & KEYS+TAGS   *
1122 REM*IN "A". WHEN TABLE FULL OR  *                  *END OF FILE SORT TABLE "A"   *
1123 REM******************************
1130 N=0:FL$="1:"+IPFILE$+",SEQ,READ":OPEN2,8,2,FL$:IFST>0THENGOSUB6000
1150 INPUT#2,IR$
1170 IFLEFT$(IR$,4)="ZZZZ"THENCLOSE2:GOTO1210
1180 N=N+1:A$(N+1)=MID$(IR$,SKSP,KLN)+RIGHT$("   "+STR$(N),3):B$(N)=IR$
1190 IFN<MXTHEN1150
1200 REM******************************
1201 REM* SET UPPER & LOWER BOUNDS   *                  *  SORT PARAMS. ENTER SORT    *
1202 REM*  AT LINE 4000              *                  *******************************
```

```
1210 A$(1)="           ":A$(N+2)="ZZZZZZZZZZZ"
1220 FORI=1TO10:S(I)=0:NEXT
1230 P=1:M=10:I=N:R=N+1
1240 IFN=0ANDSO=1THENSO=2:B$(1)=Z4:A$(2)="ZZ001":N=1:GOTO1360
1245 IFN=0THEN1470
1300 RECS=RECS+N:SO=SO+1:GOSUB5000
1310 REM********************************           *CHECK IF ANY MORE RECORDS TO*
1311 REM*BE SORTED. IF YES THEN COPY *           *TABLE "B" IN SEQUENCE TO    *
1312 REM*FILE "ASORT" OR "BSORT". IF *           *EOF THEN FORM OUTPUT FILE   *
1313 REM*FROM TABLE "B" IF SORT USED *           *ONCE ELSE MERGE "B" WITH    *
1314 REM*FILES "ASORT" & "BSORT      *           ******************************
1360 IFSO=1ANDLEFT$(IR$,4)=Z4$THENLF=14:SA=14:FL$=OPFI$+",SEQ,WRITE":GOTO1395
1370 LF=3:IFSOT/2=INT(SOT/2)THENLF=4
1380 SA=LF:IFSOT>2THEN1410
1385 F$="A":IFSOT=2THENF$="B"
1390 FL$=F$+"SORTFL,SEQ,WRITE"
1395 OPENLF,8,SA,"@1:"+FL$
1400 IFST>0THENGOSUB6000
1410 FORI=1TON
1420 PRINT#LF,B$(VAL(RIGHT$(A$(I+1),3)));CHR$(13);:NEXT
1440 REM********************************           *IF SORT=1 & EOF THEN END. IF*
1441 REM*NOT EOF THEN SORT NEXT SET  *           * OF RECORDS ELSE MERGE FILES*
1442 REM********************************
1450 IFLEFT$(IR$,4)<>Z4$THENN=0:GOTO1150
1460 IFLF=14THEN2000
1470 PRINT#3,Z4$;CHR$(13);:IFST>0THENGOSUB6000
1480 CLOSE3:IFST>0THENGOSUB6000
1490 PRINT#4,Z4$;CHR$(13);:IFST>0THENGOSUB6000
1500 CLOSE4:IFST>0THENGOSUB6000
1510 REM********************************           * ENTER MERGE S/R TO FORM    *
1511 REM*  OUTPUT FILE               *           ******************************
1520 GOSUB7000
1530 GOTO2040
2000 REM********************************           *ALL RECORDS ON OUTFUT FILE  *
2010 REM********************************
2020 PRINT#14,Z4$;CHR$(13);:IFST>0THENGOSUB6000
2030 CLOSE14:IFST>0THENGOSUB6000
2040 PRINT"[illegible]END OF SORT"
2050 PRINT"[illegible]NO. OF RECORDS SORTED = ";RECS
2060 POKE042,10:POKE043,36:CLR:LOAD"NOMINAL MENU",8
5000 P=1:M=10
5115 PRINT"*";
5150 L=2
5160 R=N+1
5180 IFR-L<MTHEN5590
5190 I=L
5200 J=R
5210 K$=A$(L)
5230 IFK$>=A$(J)THEN5270
5240 J=J-1
5250 GOTO5230
5270 IFJ>ITHEN5300
5280 A$(I)=K$
5290 GOTO5450
5300 A$(I)=A$(J)
5310 I=I+1
5330 IFA$(I)>=K$THEN5360
5340 I=I+1
5350 GOTO5330
5360 REM
5370 IFJ>ITHEN5410
5380 A$(J)=K$
5390 I=J
5400 GOTO5450
5410 A$(J)=A$(I)
5420 J=J-1
```

```
5430 GOTO5230
5450 IFR-I<I-LTHEN5520
5460 S(P)=R
5470 P=P+1
5480 S(P)=I+1
5490 P=P+1
5500 R=I-1
5510 GOTO5180
5520 S(P)=I-1
5530 P=P+1
5540 S(P)=L
5550 P=P+1
5560 L=I+1
5570 GOTO5180
5580 REM STRAIGHT INSERT
5590 J=L
5600 J=J+1
5610 IFJ>RTHEN5700
5620 K$=A$(J)
5630 I=J-1
5640 IFA$(I)<=K$THEN5680
5650 A$(I+1)=A$(I)
5660 I=I-1
5670 GOTO5640
5680 A$(I+1)=K$
5685 GOTO5600
5700 IFP=1THEN5770
5710 P=P-1
5720 L=S(P)
5730 P=P-1
5740 R=S(P)
5750 GOTO5180
5760 REM********************************          *TABLE "A" SORTED RETURN TO *
5761 REM*MAIN PATH OF PROGRAM          *          ******************************
5770 RETURN
6000 INPUT#10,R1$,R2$,R3$,R4$
6005 IFVAL(R1$)=0THENRETURN
6010 PRINT"▒DISC ERROR ▒"
6020 PRINT"▒ERROR NO ";R1$
6030 PRINT"▒ERROR MSG: ";R2$
6040 PRINT"▒PARAMETER 1 ";R3$
6050 PRINT"▒PARAMETER 2 ";R4$
6060 PRINT"▒▒"
6070 INPUT"▒CONTINUE ? (Y/N)  *███";YN$:IFYN$="Y"THENRETURN
6080 IFYN$<>"N"THEN6070
6090 END
7000 REM********************************          *MERGE RECORDS USING 4 DISC  *
7001 REM*FILES (2 IN 2 OUT). ON LAST *          *PASS WRITE TO OUTPUT FILE  *
7002 REM********************************
7010 T1$="SORTFL,SEQ,WRITE":T2$="SORTFL,SEQ,READ":NP=INT((SO+1)/2)
7015 PRINT"▒START OF MERGE▒▒"
7020 F1$="A":F2$="B":F3$="C":F4$="D":LF=5:GOTO7040
7030 WA$=F1$:F1$=F3$:F3$=WA$:WA$=F2$:F2$=F4$:F4$=WA$:LF=5:PRINT"*";
7038 REM********************************          *OPEN 2 INPUT FILES & 1 OR 2 *
7039 REM*OUTPUT FILES                **          ******************************
```



```
7040 OPEN3,8,3,F1$+T2$:IFST>0THENGOSUB6000
7050 OPEN4,8,4,F2$+T2$:IFST>0THENGOSUB6000
7060 IFNP=1THENF3$=OPFILE$:T1$=",SEQ,WRITE"
7070 OPEN5,8,5,F3$+T1$:IFST>0THENGOSUB6000
7080 IFNP=1THEN7100
7090 OPEN6,8,6,F4$+T1$:IFST>0THENGOSUB6000
7100 REM******************************          *READ FILES 3&4 & FORM FILES *
7101 REM*5&6(MEREGED)                *          ******************************
7110 IFI3$=Z4$THEN7130
7120 INPUT#3,I3$:IFST>0THENGOSUB6000
7125 K3$=MID$(I3$,SKSP,KLN)
7130 IFI4$=Z4$THENGOTO7150
7140 INPUT#4,I4$:IFST>0THENGOSUB6000
7145 K4$=MID$(I4$,SKSP,KLN)
7150 IFI3$=I4$ANDI3$=Z4$THENGOTO7400
7160 IFI3$>I4$THEN7300
7170 REM******************************          *AS I3$<=I4$ THEN W/O I3$ TO *
7171 REM*LAST OUTPUT FILE.IF I3$<LAST*          *OUTPUT RECORD THEN CHANGE   *
7172 REM*OUTPUT FILES (CHANGE "LF"   *          ******************************
7180 IFLF=6THEN7280
7190 IFK3$<K5$THEN7230
7200 PRINT#5,I3$:IFST>0THENGOSUB6000
7210 K5$=K3$:INPUT#3,I3$:IFST>0THENGOSUB6000
7220 K3$=MID$(I3$,SKSP,KLN):GOTO7150
7230 REM** START NEW STRING ON FILE 6**
7240 LF=6
7250 PRINT#6,I3$:IFST>0THENGOSUB6000
7260 K6$=K3$:INPUT#3,I3$:IFST>0THENGOSUB6000
7270 K3$=MID$(I3$,SKSP,KLN):GOTO7150
7280 IFK3$<K6$THENLF=5:GOTO7200
7290 GOTO7250
7300 REM**** WRITE I4$ TO OUTPUT **
7310 IFLF=6THEN7380
7320 IFK4$<K5$THEN7350
7330 PRINT#5,I4$:IFST>0THENGOSUB6000
7340 K5$=K4$:GOTO7130
7350 REM**** SWITCH OUTPUT FILES ***
7360 LF=6:PRINT#6,I4$:IFST>0THENGOSUB6000
7370 K6$=K4$:GOTO7130
7380 IFK4$<K6$THENLF=5:GOTO7330
7390 GOTO7360
7400 REM******************************          *END OF BOTH FILES.  SCRATCH *
7401 REM*INPUT FILES & W/O EOF       *          *RECORDS  ON OUT PUT FILES   *
7402 REM******************************
7410 CLOSE3:IFST>0THENGOSUB6000
7420 CLOSE4:IFST>0THENGOSUB6000
7430 PRINT#10,"S:"+F1$+"SORTFL,"+F2$+"SORTFL":IFST>0THENGOSUB6000
7440 PRINT#5,Z4$:IFST>0THENGOSUB6000
7450 CLOSE5:IFST>0THENGOSUB6000
7460 IFNP=1THENRETURN
7470 PRINT#6,Z4$:IFST>0THENGOSUB6000
7480 CLOSE6:IFST>0THENGOSUB6000
7490 NP=NP-1
7500 GOTO7030
READY.
```

Load and save routine

Although our Home Computing insert contains most of our VIC and 64 programs this month, we couldn't resist giving you a bonus with this fast LOAD and SAVE routine for the VIC.

It will allow you to quickly find any program stored on a tape, without referencing the tape counter (useful for those of you who are just using the original PET tape deck). As it stands the program will only work with program rather than sequential (or other) files, but it should be possible to convert from one to the other.

We look forward to receiving the first "fast sequential file" program for the VIC in the not too distant future.

```
20 FL$(1)="                            |"
30 FL$(2)="                            |"
40 FL$(3)="                            |"
50 FL$(4)="                            |"
60 FL$(5)="                            |"
70 FL$(6)="                            |"
80 FL$(7)="                            |"
90 FL$(8)="                            |"
100 FL$(9)="                           |"
110 FL$(10)="                          |"
140 PRINT"▣■■PRESS STOP ON TAPE#1"
150 IFPEEK(192)<>0GOTO150
160 PRINT"▣"
170 PRINT"    **  DIRECTORY  ** "
180 PRINT"          ___________ "
190 FORQ=1TO22:PRINT"_";:NEXT:PRINT" "
210 PRINT"| FILE |  DESCRIPTION  |
230 FORQ=1TO22:PRINT"‾";:NEXT:PRINT" "
240 FOR Q=1 TO10:PRINT" | " CHR$(Q+64);" |.";FL$(Q):NEXT
260 FORQ=1TO22:PRINT"‾";:NEXT:
270 PRINT"■WHICH FILE DO YOU WANT?"
280 GET C$:IF C$="" GOTO 280
290 IF C$<"A" OR C$>"L" GOTO280
300 BS=ASC(C$)-64:F1=BS
310 FT=BS*8.3-8
320 PRINT"▣■■■SEARCHING FOR FILE  ";C$:PRINT"■■"
330 PRINT"NAMED ";FL$(F1)
340 PRINT"■■■■PRESS FAST FORWARD ON    ■     TAPE"
350 IF PEEK(37137)<>62GOTO350
360 FT=TI+FT*60
370 IF TI<FT GOTO 370
380 POKE192,52:POKE37148,241
390 PRINT"▣■■■■■■PRESS STOP ON TAPE #1
400 IF PEEK(192)<>0 GOTO 400
405 POKE37148,14
410 PRINT"▣■■TAPE IS NOW IN CORRECT■    POSITION FOR"
420 PRINT"■FILE ";C$;", "FL$(F1)
440 PRINT"■■■   YOU CAN NOW LOAD  ■       OR SAVE "
450 PRINT"■     THIS  PROGRAM"
455 END
READY.
```

Software controlled immediate mode

Most people who are familiar with Commodore computers will realise that there are two basic modes of computer operation: immediate mode, where you enter, edit, load, save programs etc, and program mode, where the computer is under the control of the currently residing program.

Think how convenient it would be if one could combine the two modes, thus allowing programs to write themselves, edit themselves etc during program execution. Thanks to the keyboard buffer contained in the Basic workspace in all machines, this is indeed possible.

The keyboard input buffer is used to store the value of any keypresses prior to execution. Using the keyboard in immediate mode, these commands are carried out almost immediately. Such functions as clearing the screen, printing a character on the screen and so on. If you try this sort of thing during program execution, the corresponding function will be carried out when the program has finished and you're returned to immediate mode again.

Will be removed

Note that GET and INPUT statements use this buffer, so any keypresses stored at the time of their execution will be removed. You may also have noticed that a program line may be entered or the program may be run simply by pressing RETURN (or executing a CHR$(13)) when the program is on the same line as the statement.

To achieve our aim we first of all need to print onto the screen any lines that need to be entered or executed. Then we have to make the computer think that we've pressed RETURN by putting that key value into the input buffer. When the computer moves back into immediate mode it will service the keyboard as though you had pressed RETURN and will thus enter any lines or commands on the screen where the cursor happened to be positioned at the time.

Nine characters long

This buffer is just nine characters long on power-up, but this can be altered on the VIC 20 and the 8032. There is also a location in zero page which contains the number of keystrokes stored in the buffer. The locations are as follows:

Pointer to no. of keystrokes in buffer
Basic 4.0 — $009E — 158 decimal
Basic 2.0 — $009E — 158 decimal
VIC 20 — $00C6 — 198 decimal
Pointer to start of keyboard buffer
Basic 4.0 — $026F — 623 decimal
Basic 2.0 — $026F — 623 decimal
VIC 20 — $0277 — 631 decimal
Pointer to length of keyboard buffer
CBM 8032 — $00E3 — 227 decimal
VIC 20 — $0289 — 649 decimal

The following program demonstrates the various methods involved in the technique. The program is a cassette based address book, which writes data statements into which the addresses are inserted.

Lines 1000 onwards contain the data statements. Line 1000 itself is a pointer data statement that contains the current highest data statement line number; it is updated after every entry. Note that you must re-save the program after any entries have been made.

Input routine

Lines 500-570 and 900-920 are used as an input routine that uses GET statements and which will not crash if you inadvertently press return. Use cursor-up to move to a previous entry field when entering data, DEL key to delete and CLR/HOME to abort an entry. POKE 167,0 makes the cursor flash during entries and this must be restored to normal (just POKE 167,1) to stop the flashing.

Lines 800-840 print the lines on the screen as if you had typed them in, followed bya RUN. Line 835 convinces the computer that RETURN has been pressed six times.

When the program is stopped in line 840 the computer will input the lines as though you had pressed return over each line. When it comes to the RUN which has been printed on the screen, the program will be run again.

Fills the buffer

If you wish the program to continue running from a specific line number, then print RUN XXXX (where XXXX is the line number) instead of just RUN. Note that by POKEing 158 with 7 in line 835 we tell the computer that there are 7 keypresses to execute; it simply fills the buffer with carriage returns.

Line 190 demonstrates a different approach, in that the letters R, U and N, followed by a carriage return, are put into the keyboard buffer. Consequently the word RUN will appear typed in and will be executed after the program has saved itself.

We hope all this has made things a bit clearer. If not, well, you've still got the program to use!

```
5 REM ### BY DIRK WILLIAMS ###
10 CLR:DIMX$(5):PRINT"□    CASSETTE ADDRESS FILE"
20 PRINT"▒▒▒▒▒▒           ▣ 1 ■...RECALL":PRINT
30 PRINT"               ▣ 2 ■...ADD":PRINT
40 PRINT"               ▣ 3 ■...RESAVE PROGRAMME":PRINT
50 PRINT"               ▣ 4 ■...ESCAPE":PRINT
60 PRINT"▒▒▒       INPUT OPTION NUMBER: ";
70 POKE167,0
80 GETH$:IFH$<>"1"ANDH$<>"2"ANDH$<>"3"ANDH$<>"4"THEN80
85 POKE167,1
90 PRINTH$:IFH$<>"4"THEN180
100 PRINT"□▒▒       ENSURE THAT PROGRAMME HAS BEEN"
110 PRINT"       RECSAVED IF ANY ADDITIONS HAVE"
120 PRINT"       BEEN MADE DURING USE"
130 PRINT"▒▒       PRESS ▣RETURN■ TO RETURN TO MENU"
140 PRINT"       PRESS ANY OTHER KEY TO ESCAPE"
150 GETH$:IFH$=""THEN150
160 IFH$=CHR$(13)THEN10
170 U:SYS64790
180 IFH$<>"3"THEN210
190 POKE158,4:POKE623,82:POKE624,85:POKE625,78:POKE626,13
200 PRINT"□":SAVE"ADDRESS FILE":END
210 IFH$<>"1"THEN600
220 PRINT"□             RECALL OPTION MENU"
230 PRINT"▒▒▒▒           ▣ 1 ■...NAME":PRINT
240 PRINT"          ▣ 2 ■...ADDRESS (STREET)":PRINT
250 PRINT"          ▣ 3 ■...SUBURB":PRINT
260 PRINT"          ▣ 4 ■...POST CODE-(STATE)":PRINT
270 PRINT"          ▣ 5 ■...TELEPHONE NUMBER":PRINT
280 PRINT"          ▣ 6 ■...RETURN TO MAIN MENU":PRINT
290 PRINT"▒▒▒         INPUT OPTION NUMBER: ";
300 POKE167,0
310 GETH$:IFH$<>"1"ANDH$<>"2"ANDH$<>"3"ANDH$<>"4"ANDH$<>"5"ANDH$<>"6"THEN310
315 POKE167,1:T=VAL(H$)
320 IFH$="6"THEN10
330 RESTORE:READL:IFL=1000THEN10
340 L=(L-1000)/10:C=0
341 IFT=1THENDT$="NAME"
342 IFT=2THENDT$="ADDRESS"
343 IFT=3THENDT$="SUBURB"
344 IFT=4THENDT$="POST CODE"
345 IFT=5THENDT$="TELEPHONE#"
350 PRINT"□▒▒▒▒▒         INPUT ";DT$;" OR PART:"
360 IFH$="1"ORH$="2"THENZ=29
365 IFH$="3"THENZ=15
366 IFH$="5"THENZ=15
367 IFH$="4"THENZ=20
370 RT$="":N=0:X=1:Y=7:GOSUB500:IFH$="▣"THEN220
380 PRINT"□           SCANNING RECORDS▒▒▒"
385 PRINT"  ┌─────────────────────────────────────┐"
386 FORG=1TO6
387 PRINT"  | ";TAB(38);"| ":NEXT
388 PRINT"  └─────────────────────────────────────┘"
389 PRINT"▒▒▒▒▒▒▒▒▒▒▒  ADDRESS FILE - RECORD RECALL OPTION"
390 FORK=1TOL
410 FORQ=1TO5:READX$(Q):NEXT
430 Y$=LEFT$(X$(T),LEN(RT$))
440 IFY$=RT$THEN450
386 FORG=1TO6
387 PRINT"  | ";TAB(38);"| ":NEXT
388 PRINT"  └─────────────────────────────────────┘"
389 PRINT"▒▒▒▒▒▒▒▒▒▒▒  ADDRESS FILE - RECORD RECALL OPTION"
390 FORK=1TOL
410 FORQ=1TO5:READX$(Q):NEXT
430 Y$=LEFT$(X$(T),LEN(RT$))
440 IFY$=RT$THEN450
441 NEXT:IFC=0THENX=10:Y=7:GOSUB900:PRINT"RECORD DOES NOT EXIST";CHR$(7)
```

```
 442 PRINT"▧        FINISHED !!";CHR$(16);CHR$(7)
 443 PRINT"▧▥      PRESS ANY KEY WHEN READY"
 444 GETH$:IFH$=""THEN444
 445 GOTO220
 450 FORA=1TO5:X=5:Y=5+A:GOSUB900:PRINTX$(A);:GOSUB920:NEXT:C=C+1
 460 GETC$
 470 X=8:Y=17:GOSUB900:PRINT"PRESS ▧SPACE■ TO CONTINUE":FORTT=0TO200:NEXT
 471 IFC$=" "THENGOSUB900:PRINTCHR$(16):GOTO441
 475 X=8:Y=17:GOSUB900:PRINT"PRESS SPACE TO CONTINUE":FORTT=0TO200:NEXT
 478 IFC$=" "THENGOSUB900:PRINTCHR$(16):GOTO441
 480 GOTO460
 500 Y=Y+1:GOSUB900:FORV=1TOZ:PRINT"‾";:NEXT:Y=Y-1:GOSUB900:POKE167,0
 505 PRINTRT$;CHR$(16);
 510 GETH$:IFH$=""ORH$="▧"ORH$="▐"ORH$="▌"ORH$="▐▌"THEN510
 515 IFN=1ANDH$="⊐"THENPOKE167,1:RETURN
 520 IFH$="▧"THENPOKE167,1:RETURN
 540 IFH$=CHR$(20)ANDLEN(RT$)>0THENPRINTH$;:RT$=LEFT$(RT$,LEN(RT$)-1):GOTO510
 550 IFH$=CHR$(13)ANDLEN(RT$)>0THENPOKE167,1:RETURN
 560 IFLEN(RT$)+1>ZTHENPRINTCHR$(7);:GOTO510
 565 IFH$=CHR$(20)ORH$=CHR$(13)ORH$="⊐"ORH$="▧"ORH$="▐"ORH$="▌"THEN510
 570 RT$=RT$+H$:PRINTH$;:GOTO510
 600 RESTORE:READL:L1=(L-1000)/10:L=L+10
 610 PRINT"⊐   ADD RECORD - THERE ARE ";L1;"RECORDS"
 620 PRINT"▥▥▥      NAME:▧"
 630 PRINT"   ADDRESS:▧"
 640 PRINT"    SUBURB:▧"
 650 PRINT" POST CODE:▧"
 660 PRINT"TELEPHONE#:▧"
 670 RT$=X$(1):N=0:X=11:Y=4:Z=29:GOSUB500
 675 IFH$="▧"THEN10
 676 X$(1)=RT$
 680 RT$=X$(2):N=1:X=11:Y=6:Z=29:GOSUB500
 685 IFH$="▧"THEN10
 686 X$(2)=RT$
 687 IFH$="⊐"THEN670
 690 RT$=X$(3):N=1:X=11:Y=8:Z=15:GOSUB500
 695 IFH$="▧"THEN10
 696 X$(3)=RT$
 697 IFH$="⊐"THEN680
 700 RT$=X$(4):N=1:X=11:Y=10:Z=20:GOSUB500
 705 IFH$="▧"THEN10
 706 X$(4)=RT$
 707 IFH$="⊐"THEN690
 710 RT$=X$(5):N=1:X=11:Y=12:Z=15:GOSUB500
 715 IFH$="▧"THEN10
 716 X$(5)=RT$
 717 IFH$="⊐"THEN700
 718 PRINT
 720 PRINTX=11:Y=20:GOSUB900:PRINT"ARE YOU SURE ?";:POKE167,0
 730 GETH$:IFH$<>"Y"ANDH$<>"N"ANDH$<>"▧"THEN730
 731 POKE167,1:IFH$="▧"THEN10
 732 IFH$="N"THENGOSUB900:PRINTCHR$(16):GOTO670
 800 RESTORE:READL:L=L+10:PRINT"⊐▥▥▥"
 810 PRINTL;"DATA ";X$(1)
 811 PRINTL+2;"DATA ";X$(2)
 813 PRINTL+4;"DATA ";X$(3)
 814 PRINTL+6;"DATA ";X$(4)
 815 PRINTL+8;"DATA ";X$(5)
 816 PRINT"1000DATA";L
 817 PRINT"RUN"
 830 PRINT"▧▥▥"
 835 POKE158,7:FORT=0TO7:POKE623+T,13:NEXT:END
 840 STOP
 900 PRINT"▧";:FORS=1TOX:PRINT"▐";:NEXT:FORS=1TOY:PRINT"▥";:NEXT:RETURN
 920 FORLF=1TO30-LEN(X$(A)):PRINT" ";:NEXT:PRINT" ":RETURN
1000 DATA 1000
READY.
```

Disk handling program

In essence this is a simple to use "conversation" program for any Basic 4.0 PET.

After RUN, the contents of the directory are loaded into memory and a menu is printed, which details all the program's functions. When the space bar is pressed the menu disappears and all the programs on the disk (default to drive 0) are displayed and numbered in two columns down the screen.

If the number of any program is typed (using GET and full error-trapping) — that file is loaded and the machine is in command mode. If "R" is typed before the chosen number, the program is loaded and run. Other prefix letters are displayed in the menu (see lines 470-535).

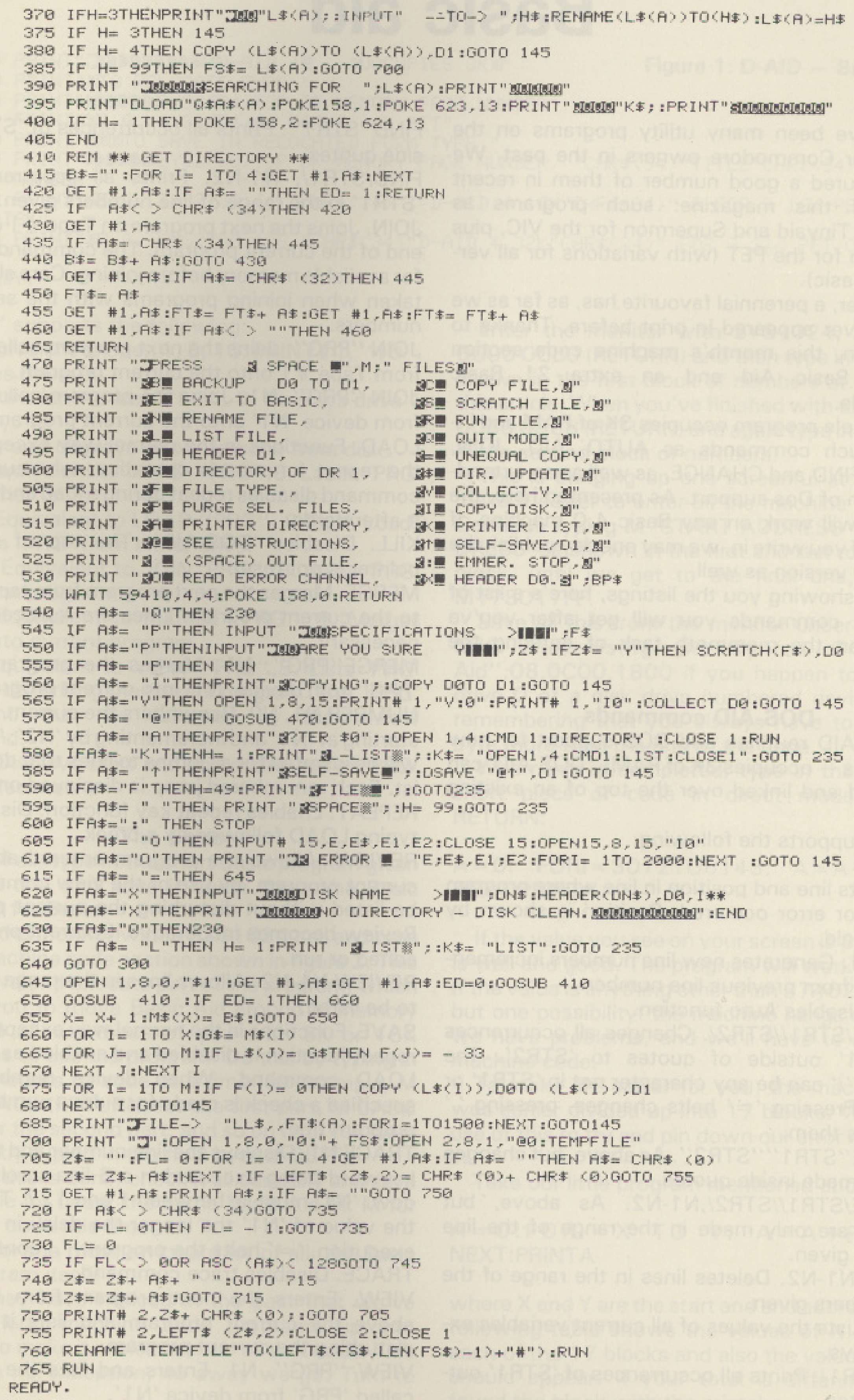
There are two choices which perhaps require explanation:

1) If the space bar is used as a prefix, the chosen file is spaced out, putting spaces after all keywords.

2) If the "=" key is pressed, the files which are not on drive 1 will be copied to it from drive 0.

The rest of it should be simple enough; we hope you find it a useful program.

```
100 CLR:DIMA$(53),L$(53),M$(53),F(53),FT$(53):BP$="▓▓":Q$=CHR$(34)
105 OPEN1,8,0,"$0":FOR I= 1TO 33:GET #1,A$:L$= L$+ A$:NEXT :CLOSE 1
110 PRINT"▓ DISK NAME   > ";L$:PRINT"▓▓▓▓▓▓▓▓▓▓▓▓▓▓  (C) 1982 NICK WILSON."
115 PRINT "▓▓▓▓▓▓▓▓▓▓FILE  >    ";:OPEN1,8,0,"$0":GET#1,A$:GET#1,A$:GOSUB410
125 GOSUB 410 :IF ED= 1THEN  140
130 M= M+ 1:L$(M)= B$:FT$(M)=FT$
135 PRINTB$;LEFT$("                ",16- LEN (B$));"████████████████████";:GOTO125
140 CLOSE 1:GOSUB 470:OPEN15,8,15,"I0":FT$=""
145 IF DS<>0 THEN A$="O" : GOTO 605
150 PRINTCHR$(147);
155 FOR  I= 1 TO  M STEP 2:M$= RIGHT$ (STR$ (I),LEN (STR$ (I))- 1)
160 A$(I)=L$(I)+LEFT$("                ",16- LEN (L$(I))):IFI<10THENM$=" "+M$
165 PRINT M$"▒▒▓"A$(I):IF M< 22THEN PRINT
170 NEXT  I:PRINTCHR$(19);:FORI=2TOMSTEP2
175 M$= RIGHT$ (STR$ (I),LEN (STR$ (I))- 1)  : IF I>= 10 THEN M$="█"+M$
185 A$(I)= L$(I)+ LEFT$ ("                ",16- LEN (L$(I)))
190 PRINT "▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓"M$"▒▒▓"A$(I);"█";:IFM<22THEN PRINT
200 NEXTI:PRINT"▓▓▒▓ENTER▒▒▒FUNCTION▒▒▒CODE▒▒>▒▒▒▒▒▒▒▒";BP$;
205 FOR I= 32768TO  33768 STEP 40:IF PEEK (I)= 102THEN 215
210 NEXT I:STOP
215 B=((I-32768)/40)+1
220 L$=LEFT$("▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓",B):L$=L$+"▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓"
225 L$=L$+"▓▓▓▓▓▓▒▒▒▒▒▒▒▒▒▒▒▒▒████████████":PRINT L$;:H=0:GETA$:IFA$<>""THEN225
235 GET A$:IF A$= ""THEN 235
240 IFA$="Q"THEN230
245 IF H< > 0THEN 300
250 IF A$= "$"THEN RUN
255 IF A$= "R"THEN H= 1:PRINT "▓RUN▒";:K$= "RUN":GOTO 235
260 IF A$= "S"THEN PRINT "▓SCRATCH▒";:H= 2:GOTO 235
265 IF A$= "N"THEN PRINT "▓RENAME▒";:H= 3:GOTO235
270 IF A$= "C"THEN PRINT "▓COPY▒";:H= 4:GOTO 235
275 IF A$= "B"THEN PRINT "▓BACKUP▒":BACKUP D0TO D1:GOTO145
280 IFA$="E"THENPRINT "▓▓▓▓▓RUN":POKE 158,1:POKE 623,13:PRINT "▓":DLOAD "UN*"
285 IF A$= "H"THEN INPUT "▓▓▓▓▓DISK NAME  >███";DN$:HEADER (DN$),D1,I**:GOTO335
290 IF A$= "G"THEN PRINT "▓▓":DIRECTORY D1:FOR I= 1TO 5000:NEXT :GOTO 145
295 GOTO 540
300 IF ASC (A$)< 48OR ASC (A$)> 57THEN 235
305 PRINT "▓"A$;:A= VAL (A$)* 10
310 GET A$:IF A$= ""THEN 310
315 IF A$= "Q"THEN 230
320 IF ASC (A$)< 48OR ASC (A$)> 57THEN 310
325 PRINT "▓"A$;:A= A+ VAL (A$):GOTO 355
330 DIRECTORYD1:FORK=1TO1000:NEXT:IFPEEK(151)<>255THEN145
335 PRINT "▓":DIRECTORY D1:FOR I= 1TO 1000:NEXT
340 COPY "UNIVERSAL WEDGE",D0TO "UNIVERSAL WEDGE",D1:PRINT "▓":DIRECTORY D1
345 DSAVE "↑",D1:PRINT "▓":DIRECTORY D1
350 FOR I= 1TO 3000:NEXT :GOTO 145
355 IF A> MOR A= 0THEN 230
360 IFH=49THENLL$=L$(A):GOTO685
365 IF H= 2THEN SCRATCH (L$(A)):L$(A)= "-$$SCRATCHED$$-":GOTO 145
```



```
370 IFH=3THENPRINT"▒▒▒"L$(A);:INPUT"  --TO-> ";H$:RENAME(L$(A))TO(H$):L$(A)=H$
375 IF H= 3THEN 145
380 IF H= 4THEN COPY (L$(A))TO (L$(A)),D1:GOTO 145
385 IF H= 99THEN FS$= L$(A):GOTO 700
390 PRINT "▒▒▒▒▒SEARCHING FOR  ";L$(A):PRINT"▒▒▒▒▒"
395 PRINT"DLOAD"Q$A$(A):POKE158,1:POKE 623,13:PRINT"▒▒▒▒"K$;:PRINT"▒▒▒▒▒▒▒▒▒"
400 IF H= 1THEN POKE 158,2:POKE 624,13
405 END
410 REM ** GET DIRECTORY **
415 B$="":FOR I= 1TO 4:GET #1,A$:NEXT
420 GET #1,A$:IF A$= ""THEN ED= 1:RETURN
425 IF  A$< > CHR$ (34)THEN 420
430 GET #1,A$
435 IF A$= CHR$ (34)THEN 445
440 B$= B$+ A$:GOTO 430
445 GET #1,A$:IF A$= CHR$ (32)THEN 445
450 FT$= A$
455 GET #1,A$:FT$= FT$+ A$:GET #1,A$:FT$= FT$+ A$
460 GET #1,A$:IF A$< > ""THEN 460
465 RETURN
470 PRINT "▒PRESS    ▒ SPACE ■",M;" FILES▒"
475 PRINT "▒B■ BACKUP   D0 TO D1,         ▒C■ COPY FILE,▒"
480 PRINT "▒E■ EXIT TO BASIC,             ▒S■ SCRATCH FILE,▒"
485 PRINT "▒N■ RENAME FILE,               ▒R■ RUN FILE,▒"
490 PRINT "▒L■ LIST FILE,                 ▒Q■ QUIT MODE,▒"
495 PRINT "▒H■ HEADER D1,                 ▒=■ UNEQUAL COPY,▒"
500 PRINT "▒G■ DIRECTORY OF DR 1,         ▒$■ DIR. UPDATE,▒"
505 PRINT "▒F■ FILE TYPE.,                ▒V■ COLLECT-V,▒"
510 PRINT "▒P■ PURGE SEL. FILES,          ▒I■ COPY DISK,▒"
515 PRINT "▒A■ PRINTER DIRECTORY,         ▒K■ PRINTER LIST,▒"
520 PRINT "▒@■ SEE INSTRUCTIONS,          ▒↑■ SELF-SAVE/D1,▒"
525 PRINT "▒ ■ (SPACE) OUT FILE,          ▒:■ EMMER. STOP,▒"
530 PRINT "▒O■ READ ERROR CHANNEL,        ▒X■ HEADER D0.▒";BP$
535 WAIT 59410,4,4:POKE 158,0:RETURN
540 IF A$= "Q"THEN 230
545 IF A$= "P"THEN INPUT "▒▒▒SPECIFICATIONS   >■■■";F$
550 IF A$="P"THENINPUT"▒▒▒ARE YOU SURE   Y■■■";Z$:IFZ$= "Y"THEN SCRATCH(F$),D0
555 IF A$= "P"THEN RUN
560 IF A$= "I"THENPRINT"▒COPYING";:COPY D0TO D1:GOTO 145
565 IF A$="V"THEN OPEN 1,8,15:PRINT# 1,"V:0":PRINT# 1,"I0":COLLECT D0:GOTO 145
570 IF A$= "@"THEN GOSUB 470:GOTO 145
575 IF A$= "A"THENPRINT"▒?TER $0";:OPEN 1,4:CMD 1:DIRECTORY :CLOSE 1:RUN
580 IFA$= "K"THENH= 1:PRINT"▒L-LIST▒";:K$= "OPEN1,4:CMD1:LIST:CLOSE1":GOTO 235
585 IF A$= "↑"THENPRINT"▒SELF-SAVE■";:DSAVE "@↑",D1:GOTO 145
590 IFA$="F"THENH=49:PRINT"▒FILE▒■";:GOTO0235
595 IF A$= " "THEN PRINT "▒SPACE▒";:H= 99:GOTO 235
600 IFA$=":" THEN STOP
605 IF A$= "O"THEN INPUT# 15,E,E$,E1,E2:CLOSE 15:OPEN15,8,15,"I0"
610 IF A$="O"THEN PRINT "▒▒ ERROR ■  "E;E$,E1;E2:FORI= 1TO 2000:NEXT :GOTO 145
615 IF A$= "="THEN 645
620 IFA$="X"THENINPUT"▒▒▒▒DISK NAME    >■■■";DN$:HEADER(DN$),D0,I**
625 IFA$="X"THENPRINT"▒▒▒▒▒▒NO DIRECTORY - DISK CLEAN.▒▒▒▒▒▒▒▒▒▒":END
630 IFA$="Q"THEN230
635 IF A$= "L"THEN H= 1:PRINT "▒LIST▒";:K$= "LIST":GOTO 235
640 GOTO 300
645 OPEN 1,8,0,"$1":GET #1,A$:GET #1,A$:ED=0:GOSUB 410
650 GOSUB  410 :IF ED= 1THEN 660
655 X= X+ 1:M$(X)= B$:GOTO 650
660 FOR I= 1TO X:G$= M$(I)
665 FOR J= 1TO M:IF L$(J)= G$THEN F(J)= - 33
670 NEXT J:NEXT I
675 FOR I= 1TO M:IF F(I)= 0THEN COPY (L$(I)),D0TO (L$(I)),D1
680 NEXT I:GOTO145
685 PRINT"▒FILE->  "LL$,,FT$(A):FORI=1TO1500:NEXT:GOTO145
700 PRINT "▒":OPEN 1,8,0,"0:"+ FS$:OPEN 2,8,1,"@0:TEMPFILE"
705 Z$= "":FL= 0:FOR I= 1TO 4:GET #1,A$:IF A$= ""THEN A$= CHR$ (0)
710 Z$= Z$+ A$:NEXT :IF LEFT$ (Z$,2)= CHR$ (0)+ CHR$ (0)GOTO 755
715 GET #1,A$:PRINT A$;:IF A$= ""GOTO 750
720 IF A$< > CHR$ (34)GOTO 735
725 IF FL= 0THEN FL= - 1:GOTO 735
730 FL= 0
735 IF FL< > 0OR ASC (A$)< 128GOTO 745
740 Z$= Z$+ A$+ " ":GOTO 715
745 Z$= Z$+ A$:GOTO 715
750 PRINT# 2,Z$+ CHR$ (0);:GOTO 705
755 PRINT# 2,LEFT$ (Z$,2):CLOSE 2:CLOSE 1
760 RENAME "TEMPFILE"TO(LEFT$(FS$,LEN(FS$)-1)+"#"):RUN
765 RUN
READY.
```

Basic aid

There have been many utility programs on the market for Commodore owners in the past. We have featured a good number of them in recent issues of this magazine: such programs as Tinymon, Tinyaid and Supermon for the VIC, plus Supermon for the PET (with variations for all versions of Basic).

However, a perennial favourite has, as far as we know, never appeared in print before. Thanks to Jan Owen, this month's machine code section features Basic Aid and an extra 21 Basic commands.

The whole program occupies 3K of RAM and includes such commands as AUTO, AID, JOIN, MERGE, FIND and CHANGE, as well as an extended version of Dos support. As presented here, the program will work on any Basic 4.0 machine. If enough of you write in, we may one day publish the Basic 2.0 version as well.

Before showing you the listings, here's a list of the extra commands you will get after you've undertaken the mammoth task of entering the code.

DOS-AID commands

(Basic AID routines and DOS support for new ROM PETs — occupies 3K of RAM). 'DOS-AID' can be loaded and linked over the top of an existing program.

'AID' supports the following:

AID. Prints line and position in line where program stopped or error occurred. Position is shown by reverse field.

AUTO N1. Generates new line numbers incrementing 'N1' from previous line number.

AUTO. Disables Auto function.

CHANGE/STR1//STR2/. Changes all occurrences of 'STR1' outside of quotes to 'STR2'. The delimiter '/' can be any character not in 'STR1' or 'STR2', Pressing '=' halts changes, pressing '.' continues them.

CHANGE"STR1""STR2". As above, but changes are only made inside quotes.

CHANGE/STR1//STR2/,N1-N2. As above, but changes are only made in the range of the line numbers given.

DELETE N1-N2. Deletes lines in the range of the line numbers given.

DUMP. Lists the values of all current variables except arrays.

FIND/STR1/. Prints all occurrences of 'STR1' outside quotes.

FIND"STR1". Prints all occurrences of 'STR1' inside quotes.

FIND/STR1/, N1-N2. Prints all occurrences of 'STR1' in the range of line numbers given.

JOIN. Joins the next program on Tape # 1 onto the end of the current program. The command checks for available memory before joining. Care should be taken when joining programs with the same line numbers.

JOIN "PRG". Joins the next program called 'PRG' from Tape # 1 onto the current program.

JOIN "PRG", N1. Joins the program called 'PRG' from device 'N1' onto the current program.

LOAD. Functions in the normal way except when the repeat function is operative, whereupon this command disables repeat during a load and enables it afterwards.

KILL. Disables 'DOS-AID'. The top of memory pointer is not reset.

MERGE. Merges the next program from tape # 1 into the current program. Lines are replaced where necessary.

MERGE"PRG", N1. Merges the program called 'PRG' from device 'N1' into current program.

NUMBER N1, N2. Renumbers the current program starting at 'N1' and incrementing by 'N2'; '65535' will be inserted for all jumps to lines that do not exist. Each renumbered jump is displayed on screen.

REPEAT. Enables repeat key function. Disabled by typing LOAD followed by a break.

REVIEW. Allows the program entered above the current program, by use of the view command, to be listed without disturbing the current program. Review becomes inoperative if current program is edited or run.

REVIEW N1-N2. Allows lines in the range 'N1-N2' to be listed.

SAVE. Functions in the normal way except that the repeat function is disabled and enabled as with the LOAD command. When device number 8 is specified a check is made for a drive number in the program title.

TRACE N1. Displays the line number and the basic keyword being executed in a 6 line scrolling window. 'N1' must lie between 1 and 127. The larger the value of 'N1' the longer the delay in program execution. '=' halts the program. '.' continues it.

TRACE. Disables trace command.

VIEW. Enters the next program from tape # 1 above the current program and lists it without disturbing the current program.

VIEW "PRG", N1. Enters and lists the program called 'PRG' from device 'N1'.

Figure 1: D-AID — Basic 4.0.

```
 10 PRINT"▮▮▮▮▮▮▮▮▮▮▮▮D-AID 4■   ▮OCCUPIES 3K▮"
 20 PRINT"▮TO RELOCATE TYPE:"
 30 PRINT"▮▮▮▮▮▮SYS2654,TOP OF MEMORY PAGE NUMBER"
 40 PRINT"▮E.G. SYS2654,64 FOR A 16K PET"
 50 PRINT"▮▮▮TO SAVE IN RELOCATED FORM TYPE:"
 60 PRINT"▮▮▮▮▮▮SYS2730,TOP OF MEMORY PAGE NUMBER, "CHR$(34)"TITLE"CHR$(34)",DEV
ICE NUMBER
 70 PRINT"▮E.G. SYS2730,64,"CHR$(34)"1:D-AID 4 16K"CHR$(34)",8 FOR A 16K PET ONT
O DISK"
 80 PRINT"▮E.G. SYS2730,128,"CHR$(34)"D-AID 4 32K"CHR$(34)" FOR A 32K PET ONTO T
APE"
READY.
```

'DOS' supports the following:

)10. Equivalent to open 1, 8, 15: PRINT # 1, "10", initialises drive 0.

)$1. Equivalent to load "$1", 8. Displays drive 1 directory.

). Reads and displays error message from disk.

/PRG. Equivalent to LOAD "PRG",8. Loads 'PRG' from either drive.

↑PRG. Equivalent to LOAD "PRG", 8:RUN. Loads and runs 'PRG' from either drive.

+PRG. Equivalent to JOIN 'PRG", 8. Joins 'PRG' to current program.

←PRG. Equivalent to MERGE "PRG", 8. Merges 'PRG' into current program.

!PRG. Equivalent to VIEW "PRG",8. Lists 'PRG' without disturbing the current program. The '!PRG' command may be followed by the review command.

#PRG. Displays start and end addresses of 'PRG' in hexadecimal.

The Code

First of all, type in the short Basic program given in figure one and save it under the name Basic AID.B: B for Basic.

Enter the monitor with a SYS1024 call and type in the machine code section shown in figure 2. This is the save and relocate part of the program, which allows you to move Basic Aid around in memory and also allows those of you with 8K or 16K machines to use the program. Do this by typing in short amounts of code at a time (for example, M 0A5E 0ACE (RETURN) for the first part, M 0AD6 0B46 for the second part, and so on until you have finished by typing in the final byte at 0BFF).

When this is done, check it all carefully and save the whole lot under the name Basic Aid.M: M for machine code this time.

Now for the most awkward lot of all: the Basic Aid program itself!

You may have noticed in the past that we've divided long machine code programs up into blocks, to make it easier to enter all that code. This month is no exception, so away we go. Turn to figure 3.

Enter the monitor with SYS1024, type in M 0C00 0CB0 (RETURN) and then type in the values shown in the first block of numbers at the end of this article. When you've finished with that, type M 0CB8 0D68 (RETURN) and again type in the values in the second block of numbers.

This is bringing up one screenful at a time, to make it easier to enter all the machine code part. Continue typing M 'START ADDRESS' 'END ADDRESS' as shown in the first and last row of each block, until we get to the final one, which is M178017FF.

Save all this from the monitor under the name M/C Aid, using the syntax S "0.M/C Aid",08,0C00,1800 if you happen to be using drive 0 of a disk drive numbered device 8, and remembering that you always have to save one byte more than the end of the code.

When this is completed, type in the following short piece of code in direct mode, and hit RETURN:

```
A=0:  FORI=3072TO6143:  A=A+PEEK(I):
NEXT:PRINTA.
```

If the value you see on your screen is 374621 all is well and good. The program will work correctly. If the value is anything other than 374621, there is but one possibility: the machine hangs up totally, we have problems, and we'll have to check the machine code.

To make life easier for you, the machine code was earlier divided up into 17 blocks. We'll make use of this to try and pin down our error in typing it in.

Take our little program mentioned above:

```
A=0:FORI=X  TO  Y:  A=A+PEEK(I):
NEXT:PRINTA
```

where X and Y are the start and end addresses. The following table shows the values of X and Y for each of the 17 blocks and also the value of A that should appear. If your total is different, we've found the block with the mistake.

Enter the monitor, re-check your code, re-save the machine code part and we should now have a working copy of Basic Aid.

```
Block #        X           Y          A
   1          3072        3255       23088
   2          3256        3439       24343
   3          3440        3623       23320
   4          3624        3807       24546
   5          3808        3991       21423
   6          3992        4175       20770
   7          4176        4359       21911
   8          4360        4543       21157
   9          4544        4727       23211
  10          4728        4911       21945
  11          4912        5095       21327
  12          5096        5279       21783
  13          5280        5463       19097
  14          5464        5647       18794
  15          5648        5831       22921
  16          5832        6015       26660
  17          6016        6143       18325
```

Finally, we have to mesh all this together into the complete program.

To avoid confusion, and please, before taking this next step, make sure you have followed all the instructions above carefully, saving everything as and when necessary, switch your PET off and back on again.

Load Basic Aid.B, but do not run it. Now load Basic Aid.M, but again don't run it. Next, load M/C Aid. Save everything under the name Basic Aid using the normal SAVE syntax (ie SAVE "O:Basic Aid",8). At last, you can RUN the program, and everything should work properly.

Play around with the commands and get used to them. You deserve it after all that typing!

Machine code for Basic Aid.

```
1. 0C00 A9 00 8D FD 03 8D FE 03
   0C08 85 A2 A9 00 85 34 A9 0C
   0C10 85 35 A9 4C 85 79 A9 68
   0C18 85 7A A9 0D 85 7B A9 E6
   0C20 85 70 A9 77 85 71 A9 D0
   0C28 85 72 A9 93 20 02 E2 A2
   0C30 FF A9 A0 A8 D0 0B E8 A0
   0C38 15 BD 7C 15 F0 13 88 F0
   0C40 F5 48 29 7F 20 02 E2 68
   0C48 10 04 A9 A0 D0 F0 E8 D0
   0C50 E8 4C 20 0F 20 42 16 20
   0C58 8C F6 A9 0D 20 02 E2 A5
   0C60 FC 20 22 D7 A5 FB 20 22
   0C68 D7 A9 20 20 02 E2 A5 CA
   0C70 20 22 D7 A5 C9 20 22 D7
   0C78 4C FF B3 F0 03 4C 00 BF
   0C80 A9 C9 85 79 A9 3A 85 7A
   0C88 A9 B0 85 7B 60 A2 1B A0
   0C90 43 A9 0D 85 BA B9 00 80
   0C98 9D 00 80 E8 C8 C6 BA D0
   0CA0 F4 8A 18 69 1B AA 98 18
   0CA8 69 1B A8 90 E4 A6 36 A5
   0CB0 37 85 5F 86 60 A2 90 38
```

Figure 2: D-AID — Machine code relocator and saver

```
 0A5E 20 F5 BE 20 F6 B8 38 A5
 0A66 11 30 05 C9 18 10 01 60
 0A6E 38 A5 11 E9 0C ED DF 15
 0A76 85 5B 20 51 0B A9 00 A8
 0A7E 85 5A 85 5C 18 AD DF 15
 0A86 69 0C 85 5B A9 18 85 5D
 0A8E A2 0D D0 07 B1 5C 91 5A
 0A96 C8 D0 F9 C6 5B C6 5D CA
 0A9E D0 F2 38 A5 11 E9 0C 85
 0AA6 5B 6C 5A 00 20 F5 BE 20
 0AAE F6 B8 38 A5 11 E9 0C ED
 0AB6 DF 15 85 5B 20 51 0B 20
 0ABE F5 BE 20 7D F4 A5 D4 C9
 0AC6 08 D0 16 A0 00 B1 DA C9
 0ACE 30 F0 07 C9 31 F0 03 4C
 0AD6 00 BF C8 B1 DA C9 3A D0
 0ADE F6 A9 00 85 C9 A9 18 85
 0AE6 CA A9 00 85 FB A9 0C 85
 0AEE FC A5 D4 D0 05 A0 74 4C
 0AF6 AF F5 C9 03 F0 F7 90 26
 0AFE A9 61 85 D3 A4 D1 D0 03
 0B06 4C 00 BF 20 A5 F4 20 D5
 0B0E F0 A5 D3 20 43 F1 A0 00
 0B16 20 BB FB A9 00 20 9E F1
 0B1E AD DF 15 4C 14 F7 20 95
 0B26 F6 20 8C F8 20 51 F3 D0
 0B2E 08 A0 64 20 85 F1 20 5C
 0B36 F4 18 AD DF 15 85 FC 69
 0B3E 0C 85 CA A9 01 20 19 F6
 0B46 A9 0C 85 FC A9 18 85 CA
 0B4E 4C 5A F7 A9 00 85 5C A8
 0B56 AA A9 0C 85 5D 18 BD 80
 0B5E 0B F0 12 65 5C 85 5C 90
 0B66 02 E6 5D 18 B1 5C 65 5B
 0B6E 91 5C E8 D0 E8 AD DF 15
 0B76 C9 80 30 02 A9 80 8D 0F
 0B7E 0C 60 0F 0C 20 18 03 BA
 0B86 23 0A 0D 05 05 38 17 17
 0B8E 0C 05 11 04 04 13 53 38
 0B96 25 07 07 20 99 20 03 15
 0B9E 06 05 33 24 1B 20 06 2C
 0BA6 B8 43 64 19 0B 1F 05 05
 0BAE 35 2C 05 36 03 0D 03 0B
 0BB6 59 05 35 16 0E 8D 40 03
 0BBE 05 03 03 05 03 07 07 05
 0BC6 03 03 07 12 1A 1A 10 0E
 0BCE 03 03 0D 07 0A 03 05 05
 0BD6 0A 05 0C 24 68 02 02 02
 0BDE 02 02 02 02 02 02 02 02
 0BE6 02 02 02 02 02 02 02 02
 0BEE 02 02 02 02 17 03 06 09
 0BF6 10 06 03 03 0D 03 66 FF
 0BFE 11 00
  READY.
```

```
2. 0CB8 20 7F CD 20 93 CF A0 00
   0CC0 A2 05 C8 B9 00 01 D0 FA
   0CC8 88 F0 0B CA B9 00 01 09
   0CD0 80 9D E3 80 D0 F2 A9 A0
   0CD8 CA 30 05 9D E3 80 10 F8
   0CE0 8D E8 80 E8 A5 B5 30 26
   0CE8 A0 00 B1 77 F0 14 30 0F
   0CF0 29 BF 09 80 9D E9 80 E8
   0CF8 C8 C0 07 D0 ED F0 32 A9
   0D00 BD 2C A9 A0 9D E9 80 E8
   0D08 E0 07 90 F6 B0 23 20 30
   0D10 14 A2 E9 C8 B9 B2 B0 30
   0D18 0B 18 69 40 9D 00 80 E8
   0D20 D0 F1 09 80 29 BF 2C A9
   0D28 A0 9D 00 80 E8 E0 F0 D0
   0D30 F6 20 48 0D A9 10 A6 A2
   0D38 CA D0 03 4C 8F 0D 8D 45
   0D40 E8 2C 4D E8 50 FB 70 F0
   0D48 20 5D 0D D0 1A 20 5D 0D
   0D50 F0 00 20 5D 0D F0 FB C9
   0D58 FF F0 F7 D0 0A AD 12 E8
   0D60 CD 12 E8 D0 F8 C9 7F 60
   0D68 85 B5 86 AD BA BD 01 01
```

```
3. 0D70 C9 0F F0 26 A6 78 E0 02
   0D78 F0 15 86 FE A6 77 86 FD
   0D80 A6 A2 F0 0B 30 09 C9 23
   0D88 D0 05 4C 8D 0C A4 B6 A6
   0D90 AD A5 B5 C9 3A B0 D0 4C
   0D98 7D 00 BD 02 01 C9 B4 D0
   0DA0 EE 20 8F 0D 90 52 A5 B5
   0DA8 10 02 E6 77 84 B6 86 BA
   0DB0 CA E8 A4 77 B9 00 02 38
   0DB8 FD 7C 15 F0 13 C9 80 F0
   0DC0 13 E6 BA E8 BD 7B 15 10
   0DC8 FA BD 7C 15 D0 E4 F0 BD
   0DD0 E8 C8 D0 E0 84 77 A5 BA
   0DD8 0A AA BD D1 15 48 BD D0
   0DE0 15 48 20 8D 0D 4C 70 00
   0DE8 20 F6 B8 A5 11 8D FD 03
   0DF0 A5 12 8D FE 03 4C 20 0F
   0DF8 68 68 A5 B5 20 F6 B8 F0
   0E00 3B AD FD 03 0D FE 03 F0
   0E08 33 A5 11 18 6D FD 03 85
   0E10 60 A5 12 6D FE 03 85 5F
   0E18 A2 90 38 20 7F CD 20 93
   0E20 CF A2 00 A9 20 9D 6F 02
```

```
4. 0E28 E8 BD 00 01 F0 06 9D 6F
   0E30 02 E8 D0 F5 A9 20 9D 6F
   0E38 02 E8 86 9E 4C 22 B4 F0
   0E40 03 4C 00 BF 78 A9 53 85
   0E48 90 A9 0E 85 91 A9 01 85
   0E50 D7 58 60 A5 97 C5 CF F0
   0E58 09 85 CF A9 10 85 D6 4C
   0E60 55 E4 C9 FF F0 F9 A5 D6
   0E68 F0 04 C6 D6 D0 F1 C6 D7
   0E70 D0 ED A9 04 85 D7 A9 00
   0E78 85 97 A9 02 85 A8 D0 DF
   0E80 20 AB 0E 20 7D F4 A5 D4
   0E88 C9 08 D0 16 A0 00 B1 DA
   0E90 C9 30 F0 07 C9 31 F0 03
   0E98 4C 00 BF C8 B1 DA C9 3A
   0EA0 D0 F6 4C E0 F6 20 AB 0E
   0EA8 4C D5 FF A5 91 C9 0E D0
   0EB0 1D A2 00 BD AE 15 08 29
   0EB8 7F 9D 6F 02 E8 28 10 F3
   0EC0 A9 3A 9D 6F 02 E8 A9 0D
   0EC8 9D 6F 02 E8 86 9E A2 0C
   0ED0 4C E0 FC 20 FB 12 A5 5C
   0ED8 A6 5D 85 21 86 22 20 A3
```

```
5. 0EE0 B5 A5 5C A6 5D 90 0A A0
   0EE8 01 B1 5C F0 04 AA 88 B1
   0EF0 5C 85 77 86 78 A5 21 38
   0EF8 E5 77 AA A5 22 E5 78 A8
   0F00 B0 1E 8A 18 65 2A 85 2A
   0F08 98 65 2B 85 2B A0 00 B1
   0F10 77 91 21 C8 D0 F9 E6 78
   0F18 E6 22 A5 2B C5 22 B0 EF
   0F20 20 B6 B4 A5 1F A6 20 18
   0F28 69 02 85 2A 90 01 E8 86
   0F30 2B 20 E9 B5 4C FF B3 A5
   0F38 2B 85 5D A5 2A 85 5C 38
   0F40 E5 2C A5 5D E5 2D 90 07
   0F48 A9 FF 85 37 4C FF B3 A0
   0F50 00 84 22 C8 B1 5C 0A 26
   0F58 22 4A 99 42 00 88 10 F4
   0F60 A5 22 F0 2B C9 01 F0 69
   0F68 C9 02 F0 3E 20 E5 0F A9
   0F70 25 20 46 BB A9 3D 20 46
   0F78 BB A0 02 B1 5C 48 C8 B1
   0F80 5C A8 68 20 BC C4 20 93
   0F88 CF 20 1D BB 4C CE 0F 20
   0F90 E5 0F A9 3D 20 46 BB 20
```

```
6. 0F98 B9 C2 A5 44 A4 45 20 D8
   0FA0 CC 20 8D CF 4C CE 0F 22
   0FA8 3D 24 20 E5 0F A2 02 BD
   0FB0 A7 0F 20 46 BB CA 10 F7
   0FB8 A0 04 B1 5C 85 20 88 B1
   0FC0 5C 85 1F 88 B1 5C 20 23
   0FC8 BB A9 22 20 46 BB 20 DB
   0FD0 BA 20 E1 FF 18 A5 5C 69
   0FD8 07 85 5C A6 5D 90 01 E8
   0FE0 86 5D 4C 3F 0F A5 42 20
   0FE8 46 BB A5 43 F0 03 20 46
   0FF0 BB 60 A9 00 2C A9 01 2C
   0FF8 A9 02 85 3E 85 3F A5 BA
   1000 C9 09 D0 02 C6 3E 20 AB
   1008 0E 20 FB B4 20 70 00 A9
   1010 00 85 9D 20 7D F4 A5 D4
   1018 D0 03 4C 00 BF C9 03 90
   1020 03 4C 14 16 20 95 F6 20
   1028 57 F8 20 49 F4 A5 D1 F0
   1030 08 20 D3 F4 D0 08 4C AD
   1038 F5 20 E5 F5 F0 F8 20 7B
   1040 F6 20 31 11 20 8C F6 20
   1048 65 11 20 A3 F8 20 2B F9
```

```
7. 1050 A5 96 F0 03 4C 25 F4 A4
   1058 3F D0 15 20 E9 B5 A5 2A
   1060 A4 2B 85 3C 84 3D 85 5C
   1068 84 5D 20 BA B4 4C 57 B6
   1070 88 D0 03 4C 25 11 4C 2E
   1078 F4 C8 B1 FB 85 11 C8 B1
   1080 FB 85 12 C8 B1 FB 99 FC
   1088 01 D0 F8 C8 84 05 20 A3
   1090 B5 90 44 A0 01 B1 5C 85
   1098 20 A5 2A 85 1F A5 5D 85
   10A0 22 A5 5C 88 F1 5C 18 65
   10A8 2A 85 2A 85 21 A5 2B 69
   10B0 FF 85 2B E5 5D AA 38 A5
   10B8 5C E5 2A A8 B0 03 E8 C6
   10C0 22 18 65 1F 90 03 C6 20
   10C8 18 B1 1F 91 21 C8 D0 F9
   10D0 E6 20 E6 22 CA D0 F2 20
   10D8 E9 B5 20 B6 B4 AD 00 02
   10E0 F0 38 18 A5 2A 85 57 65
   10E8 05 85 55 A4 2B 84 58 90
   10F0 01 C8 84 56 20 50 B3 A5
   10F8 11 A4 12 8D FE 01 8C FF
   1100 01 A5 2E A4 2F 85 2A 84
```

```
8. 1108 2B A4 05 88 B9 FC 01 91
   1110 5C 88 10 F8 20 E9 B5 20
   1118 B6 B4 18 A5 FB 65 05 85
   1120 FB 90 02 E6 FC A0 01 B1
   1128 FB F0 03 4C 79 10 4C FF
   1130 B3 38 A5 C9 E5 C7 85 21
   1138 A5 CA E5 C8 85 22 38 A5
   1140 2A A6 2B E5 3E B0 01 CA
   1148 85 C7 18 65 21 85 C9 8A
   1150 85 C8 65 22 85 CA 38 A5
   1158 C9 E5 34 A5 CA E5 35 90
   1160 03 4C CD B3 60 A4 3F 18
   1168 A9 72 69 08 88 10 FB A0
   1170 11 85 1F 84 20 A9 08 4C
   1178 23 BB 0D 56 49 45 57 49
   1180 4E 47 0D 4D 45 52 47 49
   1188 4E 47 0D 4A 4F 49 4E 49
   1190 4E 47 90 06 F0 04 C9 2D
   1198 D0 30 20 F6 B8 A5 2A A6
   11A0 2B C5 3C D0 25 E4 3D D0
   11A8 21 C5 2E D0 1D E4 2F D0
   11B0 19 20 A7 B5 20 76 00 F0
   11B8 0C C9 2D D0 0D 20 70 00
```

```
 9. 11C0 20 F6 B8 D0 05 68 68 4C
    11C8 51 B6 60 20 FB B4 A2 00
    11D0 86 46 20 DC 12 86 B7 C9
    11D8 22 D0 02 85 B7 A5 B7 85
    11E0 B8 A5 BA C9 02 D0 07 A2
    11E8 02 86 46 20 DC 12 20 70
    11F0 00 F0 03 20 F5 BE 20 FB
    11F8 12 A5 5C A6 5D 85 77 86
    1200 78 20 DF BA D0 0F A5 B7
    1208 85 B8 C8 98 18 65 77 85
    1210 77 90 02 E6 78 20 6D 15
    1218 F0 05 20 32 13 B0 03 4C
    1220 20 0F 84 52 E6 52 A4 52
    1228 A6 2E A5 2F 85 B5 B1 77
    1230 F0 D4 C9 22 D0 04 45 B8
    1238 85 B8 A5 B8 D0 E6 B1 77
    1240 DD 00 02 D0 DF E8 C8 C6
    1248 B5 D0 E3 88 84 05 84 AD
    1250 A5 46 F0 5B 20 46 13 A5
    1258 31 38 E5 2F 85 B4 F0 28
    1260 C8 F0 BC B1 77 D0 F9 18
    1268 98 65 B4 C9 02 90 40 C9
    1270 4B B0 3C A5 B4 10 02 C6
```

```
10. 1278 B5 18 65 05 85 AD B0 05
    1280 20 7A 13 F0 03 20 62 13
    1288 A5 AD 38 E5 31 A8 C8 A5
    1290 31 F0 0F 85 B6 A6 30 BD
    1298 00 02 91 77 E8 C8 C6 B6
    12A0 D0 F5 18 A5 2A 65 B4 85
    12A8 2A A5 2B 65 B5 85 2B A5
    12B0 77 A6 78 85 5C 86 5D A6
    12B8 40 A5 41 20 D4 13 20 48
    12C0 0D C9 EF F0 09 A9 00 85
    12C8 9E A4 AD 4C 22 12 20 5D
    12D0 0D C9 FF D0 F9 A9 00 85
    12D8 9E 4C 20 0F 20 70 00 85
    12E0 B5 A4 77 C8 94 2E A9 00
    12E8 95 2F B9 00 02 F0 18 C5
    12F0 B5 F0 05 F6 2F C8 D0 F2
    12F8 84 77 60 90 0D F0 0B C9
    1300 2D F0 07 C9 AB F0 03 4C
    1308 00 BF 20 F6 B8 20 A3 B5
    1310 20 76 00 F0 10 C9 2D F0
    1318 04 C9 AB D0 EA 20 70 00
    1320 20 F6 B8 D0 E2 A5 11 05
    1328 12 D0 06 A9 FF 85 11 85
```

```
11. 1330 12 60 20 6D 15 85 40 20
    1338 6D 15 85 41 38 A5 11 E5
    1340 40 A5 12 E5 41 60 A5 77
    1348 85 1F A5 78 85 20 A5 2A
    1350 85 21 A5 2B 85 22 60 A5
    1358 1F C5 21 D0 04 A5 20 C5
    1360 22 60 A4 05 C8 B1 1F A4
    1368 AD C8 91 1F 20 57 13 D0
    1370 01 60 E6 1F D0 EC E6 20
    1378 D0 E8 A4 05 B1 21 A4 AD
    1380 91 21 20 57 13 D0 01 60
    1388 A5 21 D0 02 C6 22 C6 21
    1390 4C 7A 13 20 F6 B8 A5 12
    1398 D0 04 A5 11 10 02 A9 7F
    13A0 85 A2 4C FF B3 F0 03 4C
    13A8 00 BF 20 DF BA 85 46 A6
    13B0 28 A5 29 86 5C 85 5D A0
    13B8 00 B1 5C AA C8 B1 5C D0
    13C0 03 4C 70 00 C5 FE 90 EB
    13C8 E4 FD 90 E7 C8 B1 5C AA
    13D0 C8 B1 5C 2C A0 00 84 BA
    13D8 84 09 20 83 CF A9 20 A4
    13E0 BA 29 7F 20 D2 FF C9 22
```

```
12. 13E8 D0 06 A5 09 49 FF 85 09
    13F0 C8 24 46 10 18 A6 5D 98
    13F8 38 65 5C 90 01 E8 E4 FE
    1400 90 0B C5 FD 90 07 A9 12
    1408 85 46 20 D2 FF B1 5C F0
    1410 1A 10 D0 C9 FF F0 CC 24
    1418 09 30 C8 84 BA 20 30 14
    1420 C8 B9 B2 B0 30 B9 20 D2
    1428 FF D0 F5 20 DF BA 38 60
    1430 38 E9 7F AA A0 FF CA F0
    1438 F6 C8 B9 B2 B0 10 FA 30
    1440 F5 20 F6 B8 A5 11 85 32
    1448 A5 12 85 33 20 F5 BE 20
    1450 F6 B8 A5 11 85 2E A5 12
    1458 85 2F 20 22 B6 20 6D 15
    1460 20 6D 15 D0 21 20 4D 15
    1468 20 6D 15 20 6D 15 D0 03
    1470 4C 20 0F 20 6D 15 A5 60
    1478 91 77 20 6D 15 A5 5F 91
    1480 77 20 58 15 F0 E2 20 6D
    1488 15 20 6D 15 20 6D 15 C9
    1490 22 D0 0B 20 6D 15 F0 C5
    1498 C9 22 D0 F7 F0 EE AA F0
```

```
13. 14A0 BC 10 E9 A2 04 DD 77 15
    14A8 F0 05 CA D0 F8 F0 DD A5
    14B0 77 85 38 A5 78 85 39 20
    14B8 70 00 B0 D3 20 F6 B8 20
    14C0 F7 14 A5 39 85 78 A5 38
    14C8 85 77 A0 00 A2 00 BD 01
    14D0 01 F0 11 48 20 70 00 90
    14D8 03 20 23 15 68 A0 00 91
    14E0 77 E8 D0 EA 20 70 00 B0
    14E8 08 20 32 15 20 76 00 90
    14F0 F8 C9 2C F0 BA D0 98 20
    14F8 4D 15 20 6D 15 20 6D 15
    1500 D0 08 A9 FF 85 60 85 5F
    1508 30 0E 20 6D 15 C5 11 D0
    1510 0A 20 6D 15 C5 12 D0 06
    1518 4C 87 CF 20 6D 15 20 58
    1520 15 F0 D7 20 43 15 E6 AD
    1528 20 7A 13 E6 2A D0 02 E6
    1530 2B 60 20 43 15 C6 AD 20
    1538 62 13 A5 2A D0 02 C6 2B
    1540 C6 2A 60 20 46 13 A0 00
    1548 84 05 84 AD 60 A5 32 85
    1550 60 A5 33 85 5F 4C 22 B6
```

```
14. 1558 A5 60 18 65 2E 85 60 AD
    1560 5F 00 65 2F 8D 5F 00 20
    1568 6D 15 D0 FB 60 A0 00 E6
    1570 77 D0 02 E6 78 B1 77 60
    1578 89 8A 8D A7 41 49 C4 41
    1580 55 54 CF 43 48 41 4E 47
    1588 C5 44 45 4C 45 54 C5 44
    1590 55 4D D0 46 49 4E C4 4A
    1598 4F 49 CE 4B 49 4C CC 4C
    15A0 4F 41 C4 4D 45 52 47 C5
    15A8 4E 55 4D 42 45 D2 52 45
    15B0 50 45 41 D4 52 45 56 49
    15B8 45 D7 53 41 56 C5 54 52
    15C0 41 43 C5 56 49 45 D7 BE
    15C8 C0 AF DE AB DF A1 A3 00
    15D0 A4 13 E7 0D CA 11 D2 0E
    15D8 36 0F CA 11 F7 0F 7A 0C
    15E0 A4 0E F4 0F 40 14 3E 0E
    15E8 91 11 7F 0E 92 13 F1 0F
    15F0 76 16 76 16 C7 17 C7 17
    15F8 05 16 02 16 FF 15 53 0C
    1600 A9 00 2C A9 01 2C A9 02
    1608 85 3E 85 3F A5 BA C9 15
```

```
15. 1610 D0 02 C6 3E 20 42 16 20
    1618 31 11 20 8C F6 20 C8 16
    1620 20 C0 F1 20 C0 F1 20 65
    1628 11 20 BB FB 20 8F F3 20
    1630 8C F6 A4 3F D0 03 4C 5B
    1638 10 88 D0 03 4C 25 11 4C
    1640 CE 17 20 C4 16 20 C0 F1
    1648 85 C7 20 C0 F1 85 C8 4C
    1650 55 16 4C 00 0C 20 8C F6
    1658 A9 FD 25 96 85 96 20 43
    1660 F3 20 C0 F1 A5 96 4A 4A
    1668 B0 EE E6 FB D0 02 E6 FC
    1670 24 96 50 E4 4C C6 F3 A9
    1678 08 85 D4 A0 00 B1 77 F0
    1680 23 C9 24 F0 49 A9 6F 85
    1688 D3 20 D5 F0 A5 D3 20 43
    1690 F1 A0 00 B1 77 F0 07 20
    1698 9E F1 E6 77 D0 F3 20 B9
    16A0 F1 4C 76 00 20 D2 F0 A9
    16A8 6F 85 D3 20 43 F1 20 C0
    16B0 F1 C9 0D F0 06 20 02 E2
    16B8 4C AE 16 20 02 E2 20 AE
    16C0 F1 4C 76 00 A9 01 85 9D

16. 16C8 A5 BA C9 10 30 1B A0 FF
    16D0 C8 B1 77 D0 FB 84 D1 A9
    16D8 01 85 DA A9 02 85 DB A5
    16E0 BA C9 12 30 28 A9 08 85
    16E8 D4 A9 60 85 D3 A9 00 85
    16F0 96 A4 D1 D0 03 4C 00 BF
    16F8 A4 9D F0 05 85 9D 20 49
    1700 F4 20 A5 F4 20 D2 F0 A5
    1708 D3 20 43 F1 60 A5 D2 85
    1710 BA A5 B0 85 B8 A9 60 85
    1718 D3 A9 0E 85 D2 20 B9 F1
    1720 20 63 F5 A9 00 85 96 A0
    1728 03 84 D1 A2 0E 20 AF F7
    1730 20 CF FF 85 FD A4 96 D0
    1738 07 20 CF FF 85 FE A4 96
    1740 D0 79 A4 D1 88 D0 E2 20
    1748 CC FF A6 B8 E0 03 F0 05
    1750 A6 BA 20 FE F7 A6 FD A5
    1758 FE 20 83 CF A9 20 20 D2
    1760 FF 20 CC FF A2 0E 20 AF
    1768 F7 20 CF FF 48 20 CC FF
    1770 68 A6 96 D0 46 C9 00 F0
    1778 26 A6 B8 E0 03 F0 05 A6

17. 1780 BA 20 FE F7 20 D2 FF 20
    1788 CC FF 20 35 F3 F0 2C 20
    1790 E4 FF F0 D0 C9 20 D0 CC
    1798 20 E4 FF F0 FB D0 C5 A9
    17A0 0D A6 B8 E0 03 F0 05 A6
    17A8 B8 20 FE F7 20 D2 FF 20
    17B0 CC FF 20 B9 F1 A0 02 4C
    17B8 29 17 68 20 CC FF A9 0E
    17C0 20 E2 F2 68 68 4C FF B3
    17C8 20 C4 16 20 7C F3 A5 96
    17D0 29 10 D0 28 AD C1 F3 30
    17D8 06 E6 C9 D0 02 E6 CA A5
    17E0 CA 85 2B A5 C9 85 2A 20
    17E8 E9 B5 20 B6 B4 A5 BA C9
    17F0 13 F0 03 4C FF B3 20 22
    17F8 B6 4C 4A B7 4C 25 F4 A5
    Ready
```

Superscript

The Ultimate CBM™ Word Processor

A Commodore enthusiast wanted a word processor that was simple, fast and easy to use. He wanted to handle up to 20,000 characters of text, to use a wide screen format of up to 240 characters, with full window scrolling in all directions, and be able to use the screen while printing. He wanted a word processor at a reasonable price. The enthusiast, Simon Tranmer, couldn't find one... so he wrote

Superscript

Superscript does everything he wanted... and much more. It provides a complete document preparation and storage system, making optimum use of memory and disk space. It gives full access to all the letter quality printer features, such as boldface and ribbon colour change. In short, it provides all of the advantages of a dedicated professional word processor.

Superscript

is easy to instal, because there's nothing to instal! Just load the SuperScript diskette, and your PET becomes a world quality word processor. Superscript runs on the CBM 2001, 3016, 3032, 4016, 4032, 8032 and 8096 computers, on the CBM 2040, 3040, 4040, 8250 and 8050 disk drives, all Commodore printers, and on a wide range of letter quality printers.

Superscript

does everything Commodore wanted... which is why they are adopting it for all of their forthcoming models. And finally, the magic ingredient...

Superspell

a 30,000 word disk-dictionary with automatic spelling checker, that will verify the largest SuperScript (or Wordpro) document in under two minutes... and you can easily modify the dictionary, or add your own words.

SuperScript and SuperSpell are just two of our fine CBM & PET products... please phone or write for our comprehensive data sheets on the other products listed below:

SUPERSCRIPT The Ultimate CBM Worprocessor £249.00
SUPERSPELL Disk Dictionary/Spelling Checker £150.00
MASTER Program Development System £300.00
MASTER Additional run-time keys £45.00
PM96 96K Memory Management/Basic Enhancement £99.50
VIC SCREEN Screen management/Dos Support etc......... £49.50
KRAM Keyed Disk Access (state which disk) £86.95
COMMAND-O (for Basic IV, state which Pet) £59.95
DISK-O-PRO (Adds Basic IV etc to Basic II) £59.95
SPACEMAKER 4-Rom adaptor (not for 8096) £29.95
VISICALC 32K/96K RRP £180.00, less £35.00 .... £145.00

ORDERING INFORMATION: Add 15% VAT to quoted prices. Order by post, telephone or Prestel, using cheque, ACCESS or BARCLAY card. For same-day service, telephone 01-546-7256. For over-the-counter sales, see your Commodore Dealer. (Ref AD9)

Calco Software

LAKESIDE HOUSE, KINGSTON HILL, SURREY, KT2 7QT. TEL 01-546-7256

FULLY AND PARTLY INTEGRATED ACCOUNTING SYSTEMS FOR COMMODORE 4032, 8032 or 8096

Full system a very flexible system with invoices laid out to suit almost any invoice form, sales ledger, purchase ledger, nominal ledger, cash book etc. £900 + VAT.

Purchase ledger, nominal ledger and cash book £400 + VAT.

Sales ledger and invoicing £680 + VAT.

Sales ledger and invoicing with foreign currency facility £750 + VAT.

Write or phone for full details and a demonstration or diskette
Trade enquiries welcome

ELECTRONIC AIDS (TEWKESBURY) LTD
Mythe Crest, The Mythe, Tewkesbury,
Gloucestershire, GL20 6EB
Tel: 0386 831020/0684 294003

BONUS!

The last word in payroll systems for the CBM business computer.

includes SSP!

- Keeps S.S.P records
- Sickness & absence reports
- Up to 11 overtime rates (5 for any one employee)
- Up to 20 additions/deductions (10 for any one employee)
- Up to 300 employees
- Departmental analyses
- Prints giros, cheques and year-end revenue forms
- Design your own print formats on plain or pre-printed stationery

From the authors of MICROPAY-200, comes BONUS! a most advanced, yet simple-to-use payroll program that can be tailored to meet almost any need. It could be worth looking at for S.S.P. alone! See your local CBM dealer or contact us direct.

Intex Datalog Limited Tel (0642) 781193
Eaglescliffe Industrial Estate Stockton-on-Tees Cleveland TS16 0PN Telex 58252

NEW

DISCOVER ADVENTURE
THE ULTIMATE
PET GAME

ADVENTURE
Will run on any 32K PET
Available on cassette or disk
ONLY £11.50 INCL VAT (p&p free)
Please specify whether cassette or disk required.

SUPER ADVENTURE
Disk based only.
Will run on a 4032 or 8032 with a 4040 or 8050 disk drive
ONLY £20.00 INCL VAT (p&p free)
Please specify Computer & Drive when ordering.

NOW AVAILABLE FOR CBM 64

Please send cheque/P.O. to:
IMPETUS COMPUTER SYSTEMS
Freepost Hendon, London NW4 1YB

ADVERTISERS' INDEX

(S = Supplement)

Afdec Electronics S5
Alpha Business Systems 28
Anagram 37
Audiogenic 4
Bristol Software 12
Calco 30, 53
CBS 31
CIL 15
Commodore Business Machines S12, 13
Compsoft 8
DAMS 2
Dean Electronics S5
Digital Design & Development 16
Dynatech 30
Electronic Aids 54
Greenwich Instruments 32
Impetus Computers 54
Intex Datalog 54
Kingsley 31
Landsoft 22
Microtrading S19
Mike Bignell 32
Mills Associates 26
Nimrod Software 11
Oxford Computer Systems S2
Pegasus 56
Rhombus 37
Romik 55
Simons Magee S24
Simple Software 37
SIP Ltd. S4
Soft Toys S19
Supersoft 14, 32
Whitby Computers 25

ROMIK SOFTWARE

24 Church Street, Slough SL1 1PT. Telephone: Slough (STD 0753) 71535

ROMIK PROMISE
A MINIMUM OF
ONE NEW GAME
EVERY MONTH

Britain's leading games software house are proud to announce our new range of exciting games and other software for Vic20 and ZX81 (see panel). (Games for BBC, Dragon, Spectrum and Atari available soon.)

ALL ACTION GAMES CARRY A FREE ENTRY TO NATIONWIDE COMPETITIONS WITH FANTASTIC PRIZES
ALL PROGRAMS ARE £9.99

MARTIAN RAIDER

For unexpanded Vic20

Skim as close as you dare to the surface of the planet, devastating the Martian cities, destroying ammunition dumps (gaining more time), shooting down the ground-to-air missiles

"A real action shot of the game"

MOONS OF JUPITER

For expanded Vic20, 3K, 8K or 16K

You are the Commander of a fleet of destroyers looking on from the safety of a mother ship, you send in one destroyer at a time to blast a passage through the **MOONS OF JUPITER. Your destroyers have to dodge, and blast the UFOs . . . Watch out for the Gologs** they can smash your destroyers, but you cannot harm them.

A MACHINE CODE ARCADE QUALITY GAME

MIND TWISTERS

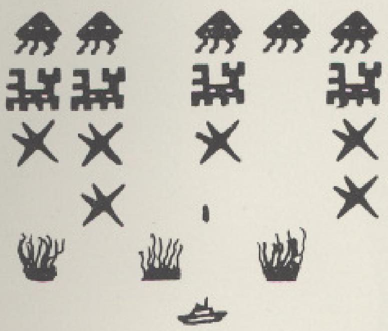
For unexpanded Vic20
Four games to stretch your brain

Blackjack, Decipher, Four Thought and Teaser are our computerised versions of very popular home games and will test your mental agility and skill for many a long hour.

SEA INVASION

Unexpanded Vic20

Fight off the attacking sea creatures for as long as you can. Shoot the whale for a surprise score, watch out for the crabs, starfish and octopuses.



MULTISOUND SYNTHESIZER

For the unexpanded Vic20

The Vic Multisound Synthesiser is very flexible and can be played in more ways than can ever be explained here, to create music and special effects. For example, create any tune, up to 255 notes (after following appropriate instructions), then press "F1" or "F3", then key "9" and enjoy the added effect. Now hit "+", listen to the difference. For a surprise — hit "−". Now add a melody over the top — hit key "8" then "7" — now play a melody, or experiment. *Have fun!*

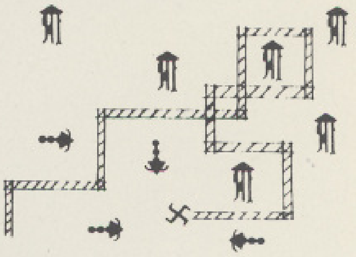
ROBOT PANIC

A fantastic high-speed game on cartridge. The price is yet to be announced, but around £16 . . .

SHARK ATTACK

For unexpanded Vic20

You are in shark-infested waters after being thrown overboard from a pirate ship. Your only protection being an atomic net which you trail behind you, trying to cover all the visible ocean and ensnare the sharks at the same time. Beware of stopping or covering your tracks for too long, if you do, then the sharks will escape and come after you. Watch out for the ever increasing deadly octopi (somtimes the sharks will eat part or all of one!)



"A real action shot of the game"

NEW NEW NEW

SPACE ATTACK

For the unexpanded Vic20

SPACE ATTACK is a game of skill. You as the pilot of an intergalactic battleship have to fight your way through wave after wave of various alien spaceships.

MACHINE CODE
ARCADE QUALITY GAME

SPECIAL OFFER . . .
C4 COMPUTER CASSETTES

£2.50 for 10; £20 for 100

Available post free from the above address only

OUR GAMES ARE AVAILABLE FROM ALL GOOD HOME COMPUTER SHOPS, INCLUDING:

Micro C inside Currys at: Birmingham (233 1105), Leeds (46601), Luton (425079), Nottingham (412455), Southampton (29676), inside Bridgers at: Bristol (650501), New Malden (01-949 2091), and at: Leicester (546224), London (01-387 9275), Manchester (834 0144) . . . Chromasonic Electronics, 48 Junction Road, Archway, London N19 (01-263 9493/9495), Maplin Electronic Supplies Ltd., P.O. Box 3, Raleigh, Essex (0702 552911/554155), Gemini Electronics, 50 Newton Street, off Piccadilly, Manchester (236 3083), Gamer, 24 Gloucester Road, Brighton . . . Dixons, Queensmere, Slough (23211) . . . Channel One, 174 High Street, Hornchurch, Essex (75613) and Golden Cross Parade, Rochford, Essex (540455), Twill Star Computer, 17 Regina Road, Southall . . . Data Assette, 44 Shroton Street, London NW1 . . . Graham & Son, 51 Gortin Road, Omagh, N. Ireland . . . Ram Electronics, 88 Fleet Road, Fleet, Hants. (5858) . . . Eccleston Electronics, Legge Lane, Birmingham . . . The Computer Centre, 14 Hemmels, Laindon, Essex (0268 416155) . . . Microspot, 15 Moorfields, Liverpool . . . R. Seedle, 47 Woodlands Road, Ansdell, Lytham St. Annes . . . Cambridge Computer Centre, 1 Emmanuel Street, Cambridge . . . Karlinda & Co., Elliott Road, Selly Oak, Birmingham . . . The Sharp Computer Shop, Melville Street, Lincoln . . . Milequip, 7A Hare Lane, Gloucester (411010) . . . North West Business Machines, Curate Street, Great Harwood, Lancs. . . . Instep Footwear, 23 King Street, Great Yarmouth . . . J.A.D., 21 Market Avenue, Plymouth (669462).

PEGASUS

puts a cutting edge on accounting's most effective tool.

The Pegasus Accounting Suite, designed specifically to optimise the effectiveness of the microcomputer as an accounting tool, is widely acknowledged to be the definitive accounting software package. More than 6000 modules are already in use worldwide, providing enlightened users with new standards of accounting efficiency, new levels of financial and management intelligence. Pegasus is fast, infallible, invaluable. And incredibly easy to use without technical or specialist knowledge.

COMPREHENSIVE CAPABILITY

SALES LEDGER
Statements of account
Aged debtors list
Account enquiries
Overdue letters
Detailed analyses
Open item or balance fwd
Up to 5000 customers
Up to 10000 transactions
Integration with invoicing and nominal
Full audit trails

PURCHASE LEDGER
Suppliers status report
Aged creditors list
Account enquiries
Cheque writing
Remittance advices
Detailed analyses
Open item or balance fwd
Up to 5000 suppliers
Up to 10000 transactions
Integration with nominal
Full audit trails

NOMINAL LEDGER
Profit and loss account
Balance sheet
Trial balance
Journal entries
Full audit trail
Double entry controls
Pre-payments & accruals
Up to 5000 accounts
Up to 10000 transactions
Integration with sales and purchase ledgers
Management & Financial accounting

INVOICING
Invoices to your own design
Credit notes to your own design
Quotations to your own design
Proforma invoices to your own design
Up to 8000 products
Price lists
Integration with stock control/ sales ledger

PAYROLL
Payslips to your own design
Integration with nominal ledger
Up to 17 user-defined payment types
Up to 17 user-defined deduction types
Caters for SSP
Prints Giros, Cheques, P60's, P35's, Coin analysis
Full departmental analysis
500 employees per diskette

STOCK CONTROL
Stock enquiries
Purchase orders
Stock movements
Integration with invoicing
Re-order report
Stock valuation
Stock take lists
Outstanding orders report
Price Lists
Stock record cards
Up to 8000 products
Up to 10000 movements

Pegasus transforms a basically dumb computer into an intelligent unit that knows exactly what to do with every sales, purchase, nominal and VAT entry; that automatically updates relevant accounts; and that will, on command, display and/or print out virtually any kind of report or analysis that you are likely to need for effective financial management.

You and the computer 'converse' in ordinary, as-typed, English and every command brings a computer response – confirmation that the command is understood, instructions on how to proceed, invitations to add, subtract, alter, etc. It even watches out for operator errors.

PEGASUS brings out the best in microcomputers by Sirius, Commodore, Victor, IBM etc. Send now for literature and details of your nearest demonstration venue.

Demonstrations are free – and free of obligation.

Pegasus Accounting Suite. British authored, internationally acclaimed.

PEGASUS

Rush me Pegasus literature and tell me where I can see a Pegasus demonstration.
Name ....
Company ....
Address ....
....
....
....
Tel No. ....
CIC
(BLOCK CAPITALS PLEASE)

PEGASUS SOFTWARE LIMITED Douglas House, 27 Station Road, Kettering, Northamptonshire. Telephone: 0536 522822 Telex: 341297 BRIKAT G